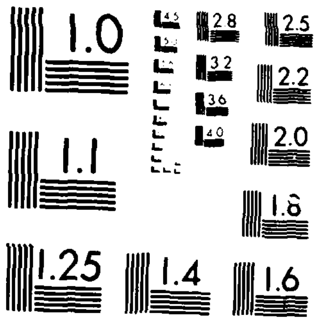
AD-A164 044 DEVELOPMENT OF A COMPUTER AIDED DESIGN PACKAGE FOR CONTROL SYSTEM DESIGN A..(U) AIR FORCE INST OF TECH WRIGHT-PATTERSON AFB OH SCHOOL OF ENGI.. 1/5

UNCLASSIFIED S K MASHIKO ET AL. DEC 85 F/G 9/2 NL


1.0
4.5
5.0
2.8
2.5
3.2
2.2
3.6
4.0
2.0
1.1
1.8
1.25
1.4
1.6

[illegible] OF A [illegible]
[illegible] CONTROL SY[illegible]
[illegible] FOR A [illegible]
[illegible]

DEPARTMENT OF THE AIR FORCE

AIR UNIVERSITY

AIR FORCE INSTITUTE OF TECHNOLOGY

Wright-Patterson Air Force Base, Ohio

1

AFIT/GE/ENG/85D-46

DEVELOPMENT OF A COMPUTER AIDED DESIGN PACKAGE FOR CONTROL SYSTEM DESIGN AND ANALYSIS FOR A PERSONAL COMPUTER (ICECAP-PC)

THESIS

Volume II of II

Susan K. Mashiko Captain, USAF

Gary C. Tarczynski Captain, USAF

AFIT/GE/ENG/85D-46

Appendix D: Data Dictionary

This appendix contains the data dictionary. The name, description, make-up, source, destination and the use of each of the variables, constants, type definitions and procedures are contained in this section. The entries are self-explanatory.

DATA DICTIONARY FOR ICECAP-PC

```
******************************************************************
Name:      abbrev_code
Aliases:   None
Type Of Entry: Constant
Description:   This character is attached to the beginning of an
               abbreviation of a command word. It indicates to
               the code that it is the abbreviation for some other
               word.
Make_up:       Char
Source:
Destination:
Used In:       val_n_dec
******************************************************************

******************************************************************
Name:      abort
Aliases:   None
Type Of Entry: Label
Description:   This is a label for a goto statement.
Make_up:       Char
Source:
Destination:
Used In:       form
******************************************************************

******************************************************************
Name:      abort2
Aliases:   None
Type Of Entry: Label
Description:   This is a label for a goto statement.
Make_up:       Char
Source:
Destination:
Used In:       form
******************************************************************

******************************************************************
Name:      abort_command
Aliases:   None
Type Of Entry: Global variable and data flow
Description:   This variable is the flag that indicates whether
               the command input by the user is the one to abort.
Make_up:       boolean
Source:        declared in icecappc
Destination:
Used In:       get_int,          get_strng,         readcom,
                get_cmd,          recover,          update
                get_real,         get_r_num,        get_fact,
                get_unfact,       poly,             gettf,
                matrxmanip1,      matrxmanip2,      get_matrx_entries,
                matrxadd,         mmatrxmlt,        get_mat,
                matrxsub,         inroot,           delroot,
                matrxinv,         form,             ppoly,
                mmatrix,          get_poly,         get_poly_name
*****************************************************************

*****************************************************************
Name:        abort_str
Aliases:     None
Type Of Entry:  Global constant
Description:    Literal that indicates abort_command
Make_up:     Character literal ($)
Source:      Declared in icecappc
Destination:
Used In:     input by the user
*****************************************************************

*****************************************************************
Name:        again
Aliases:     None
Type Of Entry:  Label
Description:    Label for a goto statement.
Make_up:     Character
Source:
Destination:
Used In:     get_poly_name
*****************************************************************

*****************************************************************
Name:       amat
Aliases:    None
Type Of Entry: Variable
Description:   This is a matrix.
Make_up:       matrix
Source:
Destination:
Used In:       matrxadd,     matrxsub,      mmatrxmlt,
               smatrxmlt,    matrxtran
*****************************************************************

*****************************************************************
Name:       apoly
Aliases:    None
Type Of Entry: Variable
Description:   This is a polynomial.
```

```
Make_up:        polynomial
Source:
Destination:
Used In:        spolymlt,     polymlt,          polysub,
                polyadd
*******************************************************************

*******************************************************************
Name:        as_assigned
Aliases:     None
Type Of Entry:  Global constant
Description:    Literal that indicates input is from the source as
                indicated by the status of the in_terminal flag
Make_up:       Character literal
Source:        Declared in icecappc
Destination:
Used In:       disp_line,      prompt_cmd,        get_int,
               gettf,          get_real,          recover,
               make_pretty,    update,            get_fact,
               ccopyy,         get_r_num,         get_poly_name,
               ppoly,          make_pretty_small_matrix, get_mat,
               disppoly,       make_pretty_large_matrix_one,
               inroot,         delroot,           disp_matrx,
               mmatrix
*******************************************************************

*******************************************************************
Name:      b
Aliases:   None
Type Of Entry: Variable
Description:   This variable is used as a temporary storage area
               the polynomial.
Make_up:       bl
Source:
Destination:
Used In:       roots
*******************************************************************

*******************************************************************
Name:      bl
Aliases:   None
Type Of Entry: Variable
Description:   This variable is used as a temporary storage area
               the polynomial.
Make_up:       array[ 1..30 ] of real
Source:
Destination:
Used In:       roots
*******************************************************************
```

```
*****************************************************************
Name:        backspace
Aliases:     None
Type Of Entry:  Global constant
Description:  Decimal ASCII value for the backspace character.
Make_up:      Integer
Source:       Declared in icecappc
Destination:  N/A
Used In:      del_lst_ch,     ck_chr,           get_strng
*****************************************************************

*****************************************************************
Name:            blanks
Aliases:         None
Type Of Entry:   Global variable
Description:     A string of blank characters used to 'erase' a line
                 on the CRT. Can also be used as a source of blank
                 characters to clear strings throughout the program.
Make_up:       string[ screen_size ]
Source:        Declared in icecappc
Destination:   N/A
Used In:       pause,               get_data,         clear_msg,
               prompt_cmd,          proces_error,     recover,
               update,              get_r_num,        get_poly_name,
               ppoly,               delroot
*****************************************************************

*****************************************************************
Name:   bld_stat_line
Type:   Procedure
Description:  This procedure builds the status line from initial-
              ization data from disk staorage. The data is in param
              group 1.
Global Variables Used:      stat_line,   help_level,   temp,
                            printer,     trans
Global Variables Changed:   stat_line
Global Constants Used:      None
Passed Variables:  help_level,     temp,        printer,
                   trans
Returned:          None
Files Read:        None
Files Written:     None
Aliases:           None
Procedures Called: None
Called By:         get_data

Version:           1.2
Date:              18 Oct 83
Author:      Vincent M. Parisi II, Capt, USAF
```

```
Contained In File:   GETDAT.PAS
******************************************************************

******************************************************************
Name:      bmat
Aliases:   None
Type Of Entry: Variable
Description:   This is a matrix.
Make_up:       matrix
Source:
Destination:
Used In:       matrxadd,     matrxsub,      mmatrxmlt,
               smatrxmlt,    matrxtran
******************************************************************

******************************************************************
Name:      bpoly
Aliases:   None
Type Of Entry: Variable
Description:   This is a polynomial.
Make_up:       polynomial
Source:
Destination:
Used In:       spolymlt,     polymlt,        polysub,
               polyadd
******************************************************************

******************************************************************
Name:             buffer
Aliases:          None
Type Of Entry:    Global type definition
Description:      This is the type definition of the structure that
                  holds the user input commands once it has been
                  separated into individual words, one word per
                  storage location.
Make_up:        array[ 1..buffersize ] of string[ wordsize ]
Source:         Declared in icecappc
Destination: N/A
Used In:        icecappc
******************************************************************

******************************************************************
Name:             bufferpointer
Aliases:          None
Type Of Entry:    Variable and data flow
Description:      This variable points to the next location in the
                  cmdbuffer that will receive the next command
                  word.
Make_up:        Integer
```

```
Source:       get_cmd,    readcom
Destination: N/A
Used In:      get_cmd,    readcom,      proces_error
******************************************************************

******************************************************************
Name:    buffersize
.liases: None
Type Of Entry:  Global constant
Description:    Maximum number of individual words allowed in a user
                input command.
Make_up:   Integer (6)
Source:       Declared in icecappc
Destination: N/A
Used In:      icecappc,       get_line,         readcom,
              val_n_dec,      displa_commandword,  help,
              select_routine
******************************************************************

******************************************************************
Name:      c
Aliases:   None
Type Of Entry: Variable
Description:   This variable is used as a temporary storage area
               the polynomial.
Make_up:       cl
Source:
Destination:
Used In:       roots
******************************************************************

******************************************************************
Name:      c
Aliases:   None
Type Of Entry: Variable
Description:   This variable is used in the IBM unique procedure
               stdout
Make_up:       char
Source:
Destination:
Used In:       stdout
******************************************************************

******************************************************************
Name:      cl
Aliases:   None
Type Of Entry: Variable
Description:   This variable is used as a temporary storage area
               the polynomial.
```

```
Make_up:      array[ 1..30 ] of real
Source:
Destination:
Used In:      roots
******************************************************************

******************************************************************
Name:    C1
Aliases: None
Type Of Entry:  Variable
Description:    Col + width - 1
Make_up:   Integer
Source:
Destination:
Used In:     rectangle
******************************************************************

******************************************************************
Name:      call_routine
Aliases:   None
Type Of Entry: Global variable and data flow
Description:   This variable is the name of the routine to call
               to accomplish the desired action from the user
               input.
Make_up:       cmdword
Source:        Declared in icecappc
Destination:
Used In:       icecappc,     get_data,        get_cmd,
               val_n_dec,    select_routine
******************************************************************

******************************************************************
Name:   ccopyy
Type:   Procedure
Description:  This procedure manages the copy function. It gets the
              source and destination location then performs the
              copy operation. ( called ccopyy because of the
              compiler function called copy )
Global Variables Used:     cmdbuffer
Global Variables Changed:  None
Global Constants Used:     as_assigned
Passed Variables:  cmdbuffer
Returned:          None
Files Read:        None
Files Written:     None
Aliases:           None
Procedures Called: clear,     gotoxy,     trim,      out_string,
                   get_location,   move_matrix,   move_poly,
                   move_tf,   highlight,   nohighlight,  pause,
                     disp_msg
Called By:           select_routine

Version:             2.0
Date:                22 Sep 85
Author:       Vincent M. Parisi II, Capt, USAF
Modified by: Susan K. Mashiko, Capt , USAF
             Gary C. Tarczynski, Capt, USAF
Contained In File:   COPY.PAS
*******************************************************************

*******************************************************************
Name:      cdpol
Aliases:   None
Type Of Entry: Variable
Description:   This is a polynomial, which is used as a temporary
               storage area for the CLTF denominator polynomial.
Make_up:       polynomial
Source:
Destination:
Used In:       form
*******************************************************************

*******************************************************************
Name:          ch
Aliases:       None
Type Of Entry: Variable
Description:   The input from the user in the get_strng procedure.
               Appended onto the string if a valid ASCII character,
               ignored if a control character.
Make_up:     Char
Source:
Destination:
Used In:     get_chr,    get_int,    ck_chr,    get_real
*******************************************************************

*******************************************************************
Name:          change_msg
Aliases:       None
Type Of Entry: Constant
Description:   The constant is the message number for help.
Make_up:     Integer
Source:
Destination:
Used In:     help
*******************************************************************

*******************************************************************
Name:      check
```

```
Aliases:   None
Type Of Entry: Variable
Description:   This is a temporary storage area that is used to
               compare the passed command word against certain
               keywords.
Make_up:       cmdword
Source:
Destination:
Used In:       define
*****************************************************************

*****************************************************************
Name:   check_word
Type:   Function
Description:  This procedure checks the word to see if it matches
              the dictionary entries.
Global Variables Used:     None
Global Variables Changed:  None
Global Constants Used:     None
Passed Variables:  decode,    command
Returned:          command,   check_word
Files Read:        None
Files Written:     None
Aliases:           None
Procedures Called: trim
Called By:         val_n_dec

Version:           1.1
Date:              29 Oct 84
Author:       Paul A. Moore, Capt, USAF
Contained In File:   VALNDEC.PAS
*****************************************************************

*****************************************************************
Name:      chg_col
Aliases:   None
Type Of Entry: Variable
Description:   This is a column location of the entry to be changed
               in the selected matrix.
Make_up:       Integer
Source:
Destination:
Used In:       chgmat
*****************************************************************

*****************************************************************
Name:      chg_row
Aliases:   None
Type Of Entry: Variable
```

```
Description:    This is a row location of the entry to be changed
                in the selected matrix.
Make_up:        Integer
Source:
Destination:
Used In:        chgmat
*****************************************************************

*****************************************************************
Name:   chgmat
Type:   Procedure
Description:  This procedure will display the requested matrix
              on the screen and ask the user which row and col
              location should be modified and will store the result
              in the original location.
Global Variables Used:     abort_command,    cmdbuffer
Global Variables Changed:  None
Global Constants Used:     as_assigned,      crt_only
Passed Variables:  cmdbuffer,   wordnumber
Returned:          None
Files Read:        MATRIX.DAT
Files Written:     MATRIX.DAT
Aliases:           None
Procedures Called: trim,      gotoxy,    disp_msg,     out_string,
                   clear_msg, out_real,  clear,        pause,
                   get_r_num, get_strng, ucase,        disp_matrx,
                   get_int,   make_pretty_small_matrix,
                   make_pretty_large_matrix_one,
                   make_pretty_large_matrix_two
Called By:   modify

Version:           1.0
Date:              22 Sep 85
Author:      Susan K. Mashiko, Capt, USAF
             Gary C. Tarczynski, Capt, USAF
Contained In File:   MODIFY.PAS
*****************************************************************

*****************************************************************
Name:       choice
Aliases:    None
Type Of Entry: Variable
Description:   This is a object that is passed to the procedure.
Make_up:       cmdword
Source:
Destination:
Used In:       chgmat,             inroot,        delroot,
               poly_into_storage, form,          disp_matrx,
               poly_from_storage, disppoly
```

```
****************************************************************

****************************************************************
Name:           chr1
Aliases:        None
Type Of Entry:  Data flow
Description:    This variable indicates to get_strng the lower
                bound of ASCII characters that can be accepted on
                input.
Make_up:     Char
Source:      get_strng
Destination: N/A
Used In:     get_strng
****************************************************************

****************************************************************
Name:           chr2
Aliases:        None
Type Of Entry:  Data flow
Description:    This variable indicates to get_strng the upper
                bound of ASCII characters that can be accepted on
                input.
Make_up:     Char
Source:      get_strng
Destination: N/A
Used In:     get_strng
****************************************************************

****************************************************************
Name:   ck_chr
Type:   Procedure
Description:  This procedure checks each character input to see
              if it is a delete or a backspace. It it is the
              screen is updated appropriately and the destin-
              ation string is changed.
Global Variables Used:     strng
Global Variables Changed:  strng
Global Constants Used:     del,    backspace
Passed Variables:  ch,   strng
Returned:          strng
Files Read:        None
Files Written:     None
Aliases:           None
Procedures Called: del_lst_ch
Called By:

Version:           1.2
Date:              18 Oct 83
Author:      Vincent M. Parisi II, Capt, USAF
```

```
Contained In File:   GETINT.PAS
*******************************************************************

*******************************************************************
Name:   clear
Type:   Procedure
Description:  This procedure clears the screen and homes the cursor
              If the status line is on the status line is displayed.
Global Variables Used:      term,  stat_on,  stat_line
Global Variables Changed:   None
Global Constants Used:      None
Passed Variables:  None
Returned:          None
Files Read:        None
Files Written:     None
Aliases:           None
Procedures Called: gotoxy
Called By:         title_slide,    get_data,      disp_msg,
                   clear_msg,      get_cmd,       recover,
                   update,         ccopyy,        help,
                   gettf,          get_matrix_entries,
                   matrxadd,       get_mat,       disp,
                   disptf,         modify,        chgmat,
                   matrxinv,       inroot,        delroot,
                   form,           disppoly,      disp_matrx,
                   ppoly,          mmatrix,       polymlt,
                   define,         get_poly,      mmatrxmlt

Version:           2.0
Date:              21 Oct 83
Author:       Vincent M. Parisi II, Capt, USAF
Contained In File:   TERMINAL.PAS
*******************************************************************

*******************************************************************
Name:   clear_msg
Type:   Procedure
Description:  The procedure clears the message indicated by the
              msg_num from the screen. It is the programmer's
              responsibility to position the cursor prior to calling
              this routine. The cursor should be placed at the
              beginning of the line where you wish the message
              erased.
Global Variables Used:      msg_dir,     blanks
Global Variables Changed:   None
Global Constants Used:      crt_only
Passed Variables:  msg_num
Returned:          None
Files Read:        None
Files Written:     None
Aliases:           None
Procedures Called: clear,        out_string
Called By:         disp_msg,     proces_error,        recover,
                   update,       get_real,            get_fact,
                   roots,        gettf,               get_mat,
                   mmatrxmlt,    chgmat,              delroot,
                   form,         get_poly_name,       get_matrx_name

Version:           1.3
Date:              18 Oct 83
Author:      Vincent M. Parisi II, Capt, USAF
Contained In File:   MSG.PAS
******************************************************************

******************************************************************
Name:    clearscreen
Type:    Procedure
Description:  This procedure clears the screen and homes the cursor
              If the status line is on the status line is displayed.
Global Variables Used:     term,  stat_on,  stat_line
Global Variables Changed:  None
Global Constants Used:     term_length,   stat_line_width
Passed Variables:  None
Returned:          None
Files Read:        None
Files Written:     None
Aliases:           None
Procedures Called: None
Called By:         icecappc

Version:           1.0
Date:              12 Dec 84
Author:      Paul A. Moore, Capt, USAF
Contained In File:   TERMINAL.PAS
******************************************************************

******************************************************************
Name:      cmat
Aliases:   None
Type Of Entry: Variable
Description:   This is a matrix.
Make_up:       matrix
Source:
Destination:
Used In:       matrxadd,     matrxsub,      mmatrxmlt
******************************************************************

******************************************************************
```

```
Name:            cmd
Aliases:         None
Type Of Entry:   Variable
Description:     This is a string of char.
Make_up:       cmdword
Source:
Destination:
Used In:       readcom,     val_n_dec
*****************************************************************

*****************************************************************
Name:            cmdbuffer
Aliases:         None
Type Of Entry:   Global variable and data flow
Description:     This is a buffer of individual commandwords input
                 by the user.
Make_up:       buffer
Source:        Declared in icecappc
Destination: N/A
Used In:       icecappc,         get_cmd,             displa_commandword,
               val_n_dec,        readcom,             proces_error,
               ccopyy,           help,                disp,
               inroot,           modify,              delroot,
               select_routine, chgmat,                ppoly,
               define,           get_poly_name
*****************************************************************

*****************************************************************
Name:            cmd_col
Aliases:         None
Type Of Entry:   Constant and data flow
Description:     This is the column that is used as the beginning of
                 user entered commands.
Make_up:       Integer
Source:        get_cmd
Destination: N/A
Used In:       get_cmd
*****************************************************************

*****************************************************************
Name:            cmd_len
Aliases:         None
Type Of Entry:   Variable
Description:     This variable is the length of the command.
Make_up:       Integer
Source:
Destination:
Used In:       check_word
*****************************************************************
```

```
*******************************************************************
Name:            cmd_row
Aliases:         None
Type Of Entry:   Constant
Description:     This constant is the row that the cursor is
                 positioned at for user entered commands.
Make_up:      Integer
Source:       get_cmd
Destination: N/A
Used In:      get_cmd
*******************************************************************

*******************************************************************
Name:            cmdword
Aliases:         None
Type Of Entry:   Global type definition
Description:     This is the type definition of a short string
                 which can then be used as a parameter for passing
                 between procedures.
Make_up:      string[ wordsize ]
Source:       Declared in icecappc
Destination: N/A
Used In:      icecappc,         check_word,       val_n_dec,
              trim,             displa_commandword, get_cmd,
              get_location,     ccopyy,           poly,
              help,             gettf,            polymanip,
              polymanip2,       get_mat,          select_routine,
              disppoly,         modify,           disp_matrx,
              poly_into_storage,  matrxmanip2, get_poly,
              poly_from_storage,  define
*******************************************************************

*******************************************************************
Name:            cmd_word
Aliases:         None
Type Of Entry:   Variable
Description:     This variable is equated to the cmdbuffer[word_num]
Make_up:      cmdword
Source:       displa_commandword
Destination: N/A
Used In:      displa_commandword
*******************************************************************

*******************************************************************
Name:       cnpol
Aliases:    None
Type Of Entry: Variable
Description:    This is a polynomial, which is used as a temporary
                storage area for the CLTF numerator polynomial.
```

```
Make_up:       polynomial
Source:
Destination:
Used In:       form
*******************************************************************

*******************************************************************
Name:          coeff_poly
Aliases:       None
Type Of Entry: variable
Description:   The variable is a temporary storage area for the
               polynomial.
Make_up:     array[ 1..maxdegl ] of real
Source:
Destination:
Used In:     roots
*******************************************************************

*******************************************************************
Name:          col
Aliases:       None
Type Of Entry: Variable
Description:   This variable is the screen column portion of the
               cursor position information.
Make_up:     Integer
Source:
Destination:
Used In:     prompt_cmd, get_r_num,  make_pretty_large_matrix_one,
             disp_matrx, chgmat,     get_poly_name,
             make_pretty_small_matrix,  get_matrx_entries,
             gotoxy
*******************************************************************

*******************************************************************
Name:          col_element
Aliases:       None
Type Of Entry: Variable
Description:   This variable is a counter for the display and
               modification of a matrix.
Make_up:       Integer
Source:
Destination:
Used In:       disp_matrx,   chgmat,   get_matrx_entries
*******************************************************************

*******************************************************************
Name:          column
Aliases:       None
Type Of Entry: Variable
```

```
Description:     This variable is the column location for the left
                 side of the rectangle.
Make_up:         Integer
Source:
Destination:
Used In:         rectangle
******************************************************************

******************************************************************
Name:            column_length
Aliases:         None
Type Of Entry:   Variable
Description:     This variable is a length of the vertical column
                 of the matrix bracket.
Make_up:         Integer
Source:
Destination:
Used In:         left_bracket,   right_bracket
******************************************************************

******************************************************************
Name:            column_location
Aliases:         None
Type Of Entry:   Variable
Description:     This variable is a column location of the  vertical
                 column of the right matrix bracket.
Make_up:         Integer
Source:
Destination:
Used In:         right_bracket
******************************************************************

******************************************************************
Name:            command
Aliases:         None
Type Of Entry:   Variable
Description:     This variable is the command word entered by the
                 user.
Make_up:      cmdword
Source:       check_word
Destination: N/A
Used In:      check_word
******************************************************************

******************************************************************
Name:            complex
Aliases:         None
Type Of Entry:   Type definition
Description:     Record type that contains each element of the
```

```
                 factored form of a polynomial.
Make_up:      complex  =  record
                 realpart  :  real;
                 imagpart  :  real;
                 end;
Source:       declared in concons
Destination:
Used In:      polynomial
******************************************************************

******************************************************************
Name:            copy
Aliases:         None
Type Of Entry:   Variable
Description:     This variable is a storage area.
Make_up:         File
Source:
Destination:
Used In:         select_routine
******************************************************************

******************************************************************
Name:            copy_msg
Aliases:         None
Type Of Entry:   Constant
Description:     This constant is the message number of the main
                 menu copy message.
Make_up:         Integer
Source:
Destination:
Used In:         help
******************************************************************

******************************************************************
Name:   COPY.PAS
Type:   File
Description:  This file manages the copy function. It gets the
              source and destination location then performs the
              copy operation for transfer functions, polynomials,
              and matrices.
Procedures Contained:  get_location,    move_tf,    move_poly,
                       move_matrix,     gettf
Version:            3.0
Date:               22 Sep 85
Author:       Vincent M. Parisi II, Capt, USAF
Modified by:  Susan K. Mashiko, Capt , USAF
              Gary C. Tarczynski, Capt, USAF
******************************************************************
```

```
******************************************************************
Name:      counter
Aliases:   None
Type Of Entry: Variable
Description:   This is a the counter that is set up internal to
               the spolymlt procedure.
Make_up:       integer
Source:
Destination:
Used In:       spolymlt
******************************************************************

******************************************************************
Name:      cpoly
Aliases:   None
Type Of Entry: Variable
Description:   This is a polynomial.
Make_up:       polynomial
Source:
Destination:
Used In:       polymlt,        polysub,          polyadd
******************************************************************

******************************************************************
Name:      crt
Aliases:   None
Type Of Entry: Global variable
Description:   This variable is the flag that indicates whether
               the output should goto the CRT, CRT=true goes to
               CRT.
Make_up:       Boolean
Source:        Declared in icecappc
Destination:
Used In:       icecappc,      out_int,        get_data,
               out_real
******************************************************************

******************************************************************
Name:      crt_only
Aliases:   None
Type Of Entry:  Global constant
Description:    Literal that indicates that the input is to come only
                from the terminal ( usually a CRT/ keyboard )
Make_up:     Character literal
Source:      Declared in icecappc
Destination: N/A
Used In:     pause,      clear_msg,        prompt_help,
             prompt_cmd, get_r_num,        recover,
             update,     make_pretty,      gettf,
              get_poly,   get_poly_name,    form,
              ppoly,      get_mat,          inroot,
              make_pretty_large_matrix_one, delroot,
              make_pretty_small_matrix
*******************************************************************

*******************************************************************
Name:            data
Aliases:         None
Type Of Entry:   Global type definition
Description:     Type definition of the file structure that contains
                 the program parameters, and initialization values,
                 terminal and printer control codes, and command syntax
                 data structure as well as the message directory.
Make_up:      data  =  record
                param  : array[ 1..num_param_group ] of param_group;
                term   : array[ 1..term_length ] of byte;
                printr : array[ 1..printer_length ] of byte;
                msg_dir : array[ 1..num_msg_dir ] of msg;
                decode_dict : dict_buffer;
                end;
Source:       Declared in msdwtype
Destination:
Used In:
*******************************************************************

*******************************************************************
Name:            data_file
Aliases:         None
Type Of Entry:   Variable
Description:     Type file of type data that contains program
                 parameters.
Make_up:      File of type data
Source:
Destination:
Used In:      get_data
*******************************************************************

*******************************************************************
Name:            dataptr
Aliases:         None
Type Of Entry:   Variable
Description:     This is a pointer.
Make_up:      ^datarecord
Source:
Destination:
Used In:      get_data
*******************************************************************
```

```
******************************************************************
Name:           datarecord
Aliases:        None
Type Of Entry:  Type definition
Description:    A record definition comprised of data.
Make_up:      datarecord  =  record
                tdata     :   data;
                end;
Source:
Destination:
Used In:      get_data
******************************************************************

******************************************************************
Name:           data_recs
Aliases:        None
Type Of Entry:  Pointer
Description:    A pointer that points to a record containing a
                record so the initialization data can be disposed of
                after it is transfered to global storage areas.
Make_up:      dataptr
Source:
Destination:
Used In:      get_data
******************************************************************

******************************************************************
Name:      decode
Aliases:   None
Type Of Entry: Data flow
Description:   This data flow is one line of decoding information
               which is used to validate and decode a command
               line input by the user. It is constructed in the
               process called get_line.
Make_up:       Type dictionary
Source:        Declared in icecappc
Destination:
Used In:       get_line,      prompt_help,       check_word
******************************************************************

******************************************************************
Name:      decode_dict
Aliases:   None
Type Of Entry: Global file variable and data flow
Description:   The command syntax data structure which contains all
               information for decoding a command and determine if
               it is valid. Record element of type data.
Make_up:       dict_buffer
Source:        Declared in icecappc
```

```
Destination:
Used In:       icecappc,   get_data
*******************************************************************

*******************************************************************
Name:   define
Type:   Procedure
Description:  This procedure will input a polynomial in either
              factored or polynomial form.
Global Variables Used:     strng,   abort_command
Global Variables Changed:  strng
Global Constants Used:     None
Passed Variables:  cmdbuffer,   wordnumber
Returned:          None
Files Read:        None
Files Written:     None
Aliases:           None
Procedures Called: clear,      pause,     disp_msg,   gettf,
                   getmat,     get_poly,  trim
Called By:     select_routine

Version:           2.0
Date:              22 Sep 85
Author:       Susan K. Mashiko, Capt, USAF
              Gary C. Tarczynski, Capt, USAF
Contained In File:   DEFINE.PAS
*******************************************************************

*******************************************************************
Name:   DEFINE.PAS
Type:   File
Description:  This file contains the procedures that handle the
              logic for the definition of various inputs: transfer
              functions and polynomials.
Procedures Contained:   get_poly,    define
Version:           3.0
Date:              22 Sep 85
Author:       Susan K. Mashiko, Capt, USAF
              Gary C. Tarczynski, Capt, USAF
*******************************************************************

*******************************************************************
Name:          define_msg
Aliases:       None
Type Of Entry: Constant
Description:   This constant is the number of the message for
               the define option.
Make_up:      Integer
Source:
```

```
Destination:
Used In:     help
*******************************************************************

*******************************************************************
Name:            def_obj
Aliases:         None
Type Of Entry:   Variable
Description:     This variable is used to indicate the object that the
                 called routine is to operate with.
Make_up:     cmdword
Source:
Destination:
Used In:     gettf,     get_mat,     define,     get_poly
*******************************************************************

*******************************************************************
Name:            degree
Aliases:         None
Type Of Entry:   Global Variable
Description:     This variable is used to indicate the degree of a
                 polynomial.
Make_up:     Integer
Source:      Declared in concons
Destination:
Used In:     make_pretty,   roots
*******************************************************************

*******************************************************************
Name:            degreel
Aliases:         None
Type Of Entry:   Global Variable
Description:     This variable is used to indicate the degree of a
                 polynomial plus one.
Make_up:     Integer
Source:      Declared in concons
Destination:
Used In:
*******************************************************************

*******************************************************************
Name:        del
Aliases:     None
Type Of Entry: Global constant
Description:   The decimal number that represents the ASCII value for
               the delete character.
Make_up:     Integer
Source:      Declared in icecappc
Destination: N/A
```

```
Used In:     ck_chr,      get_string
*******************************************************************

*******************************************************************
Name:   del_lst_ch
Type:   Procedure
Description:  This procedure deletes the last character from the
              CRT
Global Variables Used:     None
Global Variables Changed:  None
Global Constants Used:     backspace
Passed Variables:  None
Returned:          None
Files Read:        None
Files Written:     None
Aliases:           None
Procedures Called:
Called By:         ck_chr

Version:           1.0
Date:              18 Oct 83
Author:      Vincent M Parisi II, Capt, USAF
Contained In File:   GETINT.PAS
*******************************************************************

*******************************************************************
Name:   delroot
Type:   Procedure
Description:  This procedure will delete a root from a polynomial.
              If the root is complex the conjugate will also be
              removed.
Global Variables Used:     blanks,    cmdbuffer,    abort_command
Global Variables Changed:  None
Global Constants Used:     crt_only,    as_assigned
Passed Variables:  cmdbuffer,       wordnumber
Returned:          None
Files Read:        TF&POLS.DAT
Files Written:     TF&POLS.DAT
Aliases:           None
Procedures Called: clear,       gotoxy,      disppoly,     trim,
                   highlight,   out_string, nohighlight, get_int,
                   disp_msg,    pause,       clear_msg,    form_poly
Called By:     modify

Version:           2.0
Date:              22 Sep 85
Author:      Susan K. Mashiko, Capt, USAF
             Gary C. Tarczynski, Capt, USAF
Contained In File:   DELROOT.PAS
```

```
********************************************************************

********************************************************************
Name:   DELROOT.PAS
Type:   File
Description:  This file will delete a root from a polynomial.
              If the root is complex the conjugate will also be
              removed.
Procedures Contained:   delroot
Version:             2.0
Date:                22 Sep 85
Author:       Susan K. Mashiko, Capt, USAF
              Gary C. Tarczynski, Capt, USAF
********************************************************************

********************************************************************
Name:              delu
Aliases:           None
Type Of Entry:     Variable
Description:       This variable is used as the delta value of the u
                   variable.
Make_up:      Real
Source:
Destination:
Used In:      roots
********************************************************************

********************************************************************
Name:              delv
Aliases:           None
Type Of Entry:     Variable
Description:       This variable is used as the delta value of the v
                   variable.
Make_up:      Real
Source:
Destination:
Used In:      roots
********************************************************************

********************************************************************
Name:              denom
Aliases:           None
Type Of Entry:     Variable
Description:       This variable is used when roots determines if the
                   denominator of the polynomial is zero.
Make_up:      Real
Source:
Destination:
Used In:      roots
```

```
******************************************************************

******************************************************************
Name:             denom_deg
Aliases:          None
Type Of Entry:    Variable
Description:      This variable is the degree of the transfer func-
                  tions denominator.
Make_up:        Integer
Source:
Destination:
Used In:        gettf
******************************************************************

******************************************************************
Name:             denominator
Aliases:          None
Type Of Entry:    Variable
Description:      This variable is the polynomial that is the denom-
                  inator of the transfer function.
Make_up:        Polynomial
Source:
Destination:
Used In:        gettf,   disptf
******************************************************************

******************************************************************
Name:             dest
Aliases:          None
Type Of Entry:    variable
Description:      This variable determines where the output will go.
                  c - crt
                  p - printer
                  b - list_dev
                  a - as_assigned
Make_up:       Char
Source:        Declared in out_string
Destination: N/A
Used In:       out_string,   out_int,    out_real
******************************************************************

******************************************************************
Name:             destination
Aliases:          None
Type Of Entry:    Variable
Description:      This variable is the stor_loc number for the
                  destination.
Make_up:        Integer
Source:
```

```
Destination:
Used In:       ccopyy
*********************************************************************

*********************************************************************
Name:           dest_loc
Aliases:        None
Type Of Entry:  Variable
Description:    This variable is the stor_loc number for the
                destination.
Make_up:       Integer
Source:
Destination:
Used In:       move_tf,       move_poly,       move_matrix,
               ccopyy
*********************************************************************

*********************************************************************
Name:           dict_buffer
Aliases:        None
Type Of Entry:  Global type definition
Description:    Type definition of the structure that contains
                the command syntax data that is read from disk as
                part of the structure data.
Make_up:       dict_buffer  =  record
                 ptrs    : array[ 1..num_ptrs ] of ptr_recs;
                 words   : array[ 1..num_words ] of string[wordlength];
                 abbrev  : array[ 1..num_words ] of integer;
                 end;
Source:        Declared in msdwtype
Destination:
Used In:       icecappc,      msdwtype,      get_line,
               get_data
*********************************************************************

*********************************************************************
Name:           dictionary
Aliases:        None
Type Of Entry:  Global type definition
Description:    This is the type definition of an abstract record
                which makes up a data flow.
Make_up:       dictionary = record
                  dictword    : string[ wordsize ];
                  matchp      : integer;
                  nomatchp    : integer;
                  end;
Source:        Declared in icecappc
Destination: N/A
Used In:       icecappc,      check_word,      get_line
```

```
*****************************************************************

*****************************************************************
Name:           dimension
Aliases:        None
Type Of Entry:  Variable
Description:    This variable is the dimension of the matrix.
Make_up:     Integer
Source:
Destination:
Used In:     matrxinv
*****************************************************************

*****************************************************************
Name:   disp
Type:   Procedure
Description:  This procedure contains the logic to diaplay the
              selected DISPLAY option on the screen.
Global Variables Used:     cmdbuffer
Global Variables Changed:  None
Global Constants Used:     None
Passed Variables:  cmdbuffer,    wordnumber
Returned:          None
Files Read:        None
Files Written:     None
Aliases:           None
Procedures Called: disptf,   trim,    ppoly,    clear,
                   mmatrix,  disp_msg,  pause
Called By:         select_routine

Version:           1.0
Date:              4 Sep 85
Author:      Susan K. Mashiko, Capt, USAF
             Gary C. Tarczynski, Capt, USAF
Contained In File:   DISP.PAS
*****************************************************************

*****************************************************************
Name:   displa_commandword
Type:   Procedure
Description:  This procedure displays the commandword pointed to
              by word_num.
Global Variables Used:     cmdbuffer
Global Variables Changed:  None
Global Constants Used:     wordsize,   buffersize
Passed Variables:  cmdbuffer,    word_num
Returned:          None
Files Read:        None
Files Written:     None
```

```
Aliases:             None
Procedures Called: out_string,      trim
Called By:           get_cmd,       proces_error

Version:             1.1
Date:                30 Jun 84
Author:        Vincent M Parisi II, Capt, USAF
Modifier:      Paul A Moore, Capt, USAF
Contained In File:   DISPLAYC.PAS
*******************************************************************

*******************************************************************
Name:   DISPLAYC.PAS
Type:   File
Description:  This file contains the procedure to display the
              commandword pointed to by word_num.
Procedures Contained: displa_commandword
Version:       1.1
Date:          30 Jun 84
Author:        Vincent M Parisi II, Capt, USAF
*******************************************************************

*******************************************************************
Name:            display_msg
Aliases:         None
Type Of Entry:   Variable
Description:     This variable is the number of the help message for
                 the display function.
Make_up:       Integer
Source:
Destination:
Used In:       help
*******************************************************************

*******************************************************************
Name:            display_word
Aliases:         None
Type Of Entry:   Variable
Description:     This variable is the command word that is displayed
                 to the user.
Make_up:       msg_line
Source:
Destination:
Used In:       prompt_help
*******************************************************************

*******************************************************************
Name:   disp_line
Type:   Procedure
```

```
Description:  This procedure reads one line of text from the file
              MSG.DAT and displays it on the assigned device.
Global Variables Used:     msg_txt
Global Variables Changed:  None
Global Constants Used:     as_assigned,   screenwidth
Passed Variables:  rec_num
Returned:          None
Files Read:        HELP.SYS
Files Written:     None
Aliases:           None
Procedures Called: out_string
Called By:         disp_msg

Version:           1.2
Date:              18 Oct 83
Author:      Vincent M Parisi II, Capt, USAF
Contained In File:   MSG.PAS
*********************************************************************

*********************************************************************
Name:   disp_matrx
Type:   Procedure
Description:  This procedure displays the matrix from a record in
              'matrix.dat' The user should place a pause in his
              code to keep the display on the screen.
Global Variables Used:     matrix
Global Variables Changed:  None
Global Constants Used:     as_assigned
Passed Variables:  choice
Returned:          choice
Files Read:        MATRIX.DAT
Files Written:     None
Aliases:           None
Procedures Called: clear,   gotoxy,   out_string,    disp_msg,
                   make_pretty_small_matrix,  out_real,   trim,
                   make_pretty_large_matrix_one,   pause,
                   make_pretty_large_matrix_two
Called By:         matrxmanip1,   matrxmanip2,    mmatrix

Version:           2.0
Date:              20 Sep 85
Author:      Susan K. Mashiko, Capt, USAF
             Gary C. Tarczynski, Capt, USAF
Contained In File:   MATRIX.PAS
*********************************************************************

*********************************************************************
Name:   disp_msg
Type:   Procedure
```

```
Description:  This procedure displays the message pointed to by the
              parameter passed in, msg_num. The message is dis-
              played at the current cursor position. If the message
              length is longer that 23 lines the display stops after
              showing 22 lines and waits for the user to enter a
              <CR>. If a '$' is entered the procedure is exited and
              returns to calling procedure.
Global Variables Used:     msg_dir
Global Variables Changed:  None
Global Constants Used:     None
Passed Variables:  msg_num
Returned:          None
Files Read:        None
Files Written:     None
Aliases:           None
Procedures Called: disp_line,      gotoxy,          clear,
                   clear_msg,
Called By:         proces_error,      recover,        update,
                   make_pretty,       ccopyy,         help,
                   get_real,          get_fact,       roots,
                   gettf,             define,         mmatrix,
                   mmatrxmlt,         getmat,         matrxadd,
                   modify,            matrxinv,       disptf,
                   delroot,           form,           disppoly,
                   ppoly,             get_poly,       disp_matrix,
                   disp,              get_poly_name,  get_matrx_name

Version:           3.1
Date:              23 Aug 85
Author:         Vincent M Parisi II, Capt, USAF
Modified by:    Susan K. Mashiko, Capt, USAF
                Gary C. Tarczynski, Capt, USAF
Contained In File:   MSG.PAS
*************************************************************

*************************************************************
Name:           disp_obj
Aliases:        None
Type Of Entry:  Variable
Description:    This variable is used to indicate the object that the
                called routine is to operate with.
Make_up:     cmdword
Source:
Destination:
Used In:     gettf
*************************************************************

*************************************************************
Name:    DISP.PAS
```

```
Type:   File
Description:  This file contains the logic to display the
              selected DISPLAY option on the screen.
Procedures Contained:  disp,  disptf
Version:            1.0
Date:               4 Sep 85
Author:        Susan K. Mashiko, Capt, USAF
               Gary C. Tarczynski, Capt, USAF
*******************************************************************

*******************************************************************
Name:   disppoly
Type:   Procedure
Description:  This procedure displays the polynomial form a record
              in 'tf&pols.dat'  The user should place a pause in
              his code to keep the display on the screen.
Global Variables Used:     polynomial
Global Variables Changed:  None
Global Constants Used:     as_assigned
Passed Variables:  choice
Returned:           None
Files Read:         TF&POLS.DAT
Files Written:      None
Aliases:            None
Procedures Called:  clear,   gotoxy,   out_string,    disp_msg,
                    make_pretty,  out_real,   trim
Called By:          polymanip,   polymanip2,   ppoly,   inroot,
                    delroot,     get_poly

Version:            1.0
Date:               6 Sep 85
Author:        Susan K. Mashiko, Capt, USAF
               Gary C. Tarczynski, Capt, USAF
Contained In File:   POLY.PAS
*******************************************************************

*******************************************************************
Name:   disptf
Type:   Procedure
Description:  This procedure displays the transfer function from
              a record in 'tf&pols.dat'
Global Variables Used:     None
Global Variables Changed:  None
Global Constants Used:     as_assigned
Passed Variables:  disp_obj
Returned:           None
Files Read:         TF&POLS.DAT
Files Written:      None
Aliases:            None
```

```
Procedures Called: clear,   gotoxy,   out_string,   disp_msg,
                   make_pretty, out_real,  trim,   pause
Called By:         disp

Version:           2.0
Date:              25 Sep 85
Author:        Susan K. Mashiko, Capt, USAF
               Gary C. Tarczynski, Capt, USAF
Contained In File:   DISP.PAS
*******************************************************************

*******************************************************************
Name:              disp_row
Aliases:           None
Type Of Entry:     Variable
Description:       This variable is the row offset that the display
                   of the numerator, denominator, or polynomial should
                   be started on.
Make_up:       Integer
Source:
Destination:
Used In:       gettf,        poly,     get_poly
*******************************************************************

*******************************************************************
Name:              divisor
Aliases:           None
Type Of Entry:     Variable
Description:       This variable is the divisor used in the calculation
                   of the inverse of a matrix.
Make_up:       Real
Source:
Destination:
Used In:       matrxinv
*******************************************************************

*******************************************************************
Name:              dlen
Aliases:           None
Type Of Entry:     Variable
Description:   This variable is the length of the dictionary.
Make_up:       Integer
Source:        get_line
Destination:
Used In:       get_line
*******************************************************************

*******************************************************************
Name:              d_len
```

```
Aliases:         None
Type Of Entry:   Variable
Description:     This variable is the length of dword
Make_up:       Integer
Source:
Destination:
Used In:       check_word
*****************************************************************

*****************************************************************
Name:            DONEWORD
Aliases:         None
Type Of Entry:   Global constant
Description:
Make_up:       Character
Source:        Declared in msdwcons
Destination:
Used In:       prompt_help,    val_n_dec
*****************************************************************

*****************************************************************
Name:            dword
Aliases:         None
Type Of Entry:   Variable
Description:     This variable is the dictionary word the user input
                 is compared with.
Make_up:       cmdword
Source:
Destination:
Used In:       check_word
*****************************************************************

*****************************************************************
Name:            ENDCODE
Aliases:         None
Type Of Entry:   Global constant
Description:     This unique number indicates that the end has been
                 reached in the trace through the command syntax
                 structure. Indicates to prompt_help that no more
                 words are to be displayed as the end of valid objects
                 for the previously entered cpmmand words have been
                 reached.
Make_up:       Integer
Source:        Declared in msdwcons
Destination:
Used In:       prompt_help,    val_n_dec
*****************************************************************

*****************************************************************
```

```
Name:           epsi
Aliases:        None
Type Of Entry:  Variable
Description:    This number is used for comparison in roots. Once
                the delta value is less than epsi then the converged
                root is considered valid.
Make_up:      Real
Source:
Destination:
Used In:      roots
*****************************************************************

*****************************************************************
Name:           error_code
Aliases:        None
Type Of Entry:  Data flow
Description:    This indicates which problem occurred in the
                command decoding process of val_n_dec. The user
                never sees these codes per se, only the error
                messages generated in response to them.
Make_up:      Char
              A or a - no error, entry value used as control for the
                       the while statement.
              N or n - exit value when successful validation has
                       been accomplished.
              B or b - word does not exist in dictionary.
              C or c - Indicates too many words in command.
              D or d - Indicates the command is incomplete.
Source:       get_cmd,   val_n_dec
Destination:
Used In:      get_cmd,   val_n_dec,     proces_error
*****************************************************************

*****************************************************************
Name:           ff
Aliases:        None
Type Of Entry:  Global constant
Description:    This is the decimal value for the form feed
                character.
Make_up:      Integer
Source:       Declared in msdwcons
Destination:
Used In:
*****************************************************************

*****************************************************************
Name:           field
Aliases:        None
Type Of Entry:  Data flow
```

```
Description:    This parameter specifies the width for numerical
                output. For example: if it is a 5 and the number
                that is output is a 12 then the number 12 will
                be right justified in five space field.
Make_up:      Integer
Source:
Destination:
Used In:      out_int
*******************************************************************

*******************************************************************
Name:           fieldwidth
Aliases:        None
Type Of Entry:  Variable
Description:    This number is passed to outstring to indicate
                how long the number to be output is.
Make_up:      Integer
Source:
Destination:
Used In:      out_real
*******************************************************************

*******************************************************************
Name:           first
Aliases:        None
Type Of Entry:  Variable
Description:    This variable is used to pass a the name of a poly-
                nomial or transfer function.
Make_up:      cmdword
Source:
Destination:
Used In:      mmatrix,    ppoly,   polmanip,   polmanip2,
              matrxmanip2
*******************************************************************

*******************************************************************
Name:   form
Type:   Procedure
Description:  This procedure will form OLTF's and CLTF's
Global Variables Used:     abort_command
Global Variables Changed:  None
Global Constants Used:     crt_only
Passed Variables:  None
Returned:          None
Files Read:        None
Files Written:     None
Aliases:           None
Procedures Called: clear,    gotoxy,   disp_msg,    out_string,
                   get_int, polymlt,   pause,       clear_msg,
                    poly_from_storage,  poly_into_storage,
                    highlight,  nohighlight,   spolymlt,
                    polyadd,   disptf
Called By:          select_routine

Version:            1.0
Date:               7 Aug 85
Author:         Susan K. Mashiko, Capt, USAF
                Gary C. Tarczynski, Capt, USAF
Contained In File:   FORM.PAS
*******************************************************************

*******************************************************************
Name:             form_msg
Aliases:          None
Type Of Entry:    Variable
Description:      This number is number of the message for help
                  for the form command.
Make_up:        Integer
Source:
Destination:
Used In:        help
*******************************************************************

*******************************************************************
Name:   form_poly
Type:   Procedure
Description:  This procedure will form a polynomial from the
              factored form.
Global Variables Used:     None
Global Variables Changed:  None
Global Constants Used:     maxdegl
Passed Variables:   poly
Returned:           poly
Files Read:         None
Files Written:      None
Aliases:            None
Procedures Called:  None
Called By:          poly,    inroot,     delroot

Version:            1.0
Date:               26 Aug 85
Author:         Susan K. Mashiko, Capt, USAF
                Gary C. Tarczynski, Capt, USAF
Contained In File:   GETTF.PAS
*******************************************************************

*******************************************************************
Name:   FORM.PAS
```

```
Type:   File
Description:  This file will form OLTF's and CLTF's
Procedure contained:   poly_from_storage,  poly_into_storage,
                       form
Version:             1.0
Date:                7 Aug 85
Author:      Susan K. Mashiko, Capt, USAF
             Gary C. Tarczynski, Capt, USAF
*****************************************************************

*****************************************************************
Name:             gain
Aliases:          None
Type Of Entry:    Variable
Description:      This variable is the storage area for the gain of
                  the transfer function.
Make_up:      Real
Source:
Destination:
Used In:      form
*****************************************************************

*****************************************************************
Name:             gdpoly
Aliases:          None
Type Of Entry:    Variable
Description:      This variable is a polynomial, the denominator of
                  the feedforward transfer function.
Make_up:      polynomial
Source:
Destination:
Used In:      form
*****************************************************************

*****************************************************************
Name:   getchi
Type:   Function
Description:  This function gets one character from a string and
              returns it to the read function for conversion.
Global Variables Used:     strng
Global Variables Changed:  strng
Global Constants Used:     None
Passed Variables:  None
Returned:          char
Files Read:        None
Files Written:     None
Aliases:           None
Procedures Called: None
Called By:
```

```
Version:           1.0
Date:              18 Oct 83
Author:       Vincent M Parisi II, Capt, USAF
Contained In File:   GETINT.PAS
******************************************************************

******************************************************************
Name:   get_cmd
Type:   Procedure
Description:  This procedure handles all processing associated with
              getting a valid command from the user. It is called
              by the program and operation is maintained here until
              a decoded and validated command is entered.
Global Variables Used:      help_level,   cmdbuffer,   call_routine,
                            abort_command
Global Variables Changed:  abort_command
Global Constants Used:      yes
Passed Variables:  cmdbuffer,    call_routine,     num_of_commands
Returned:          num_of_commands
Files Read:        None
Files Written:     None
Aliases:           None
Procedures Called: gotoxy,       readcom,          get_line,
                   val_n_dec,    prompt_help,      displa_commandword,
                   prompt_cmd,   instruction,      proces_error,
                   clear
Called By:         icecappc

Version:           3.1
Date:              16 Aug 83
Author:       Vincent M Parisi II, Capt, USAF
Contained In File:   GETCOM.PAS
******************************************************************

******************************************************************
Name:   GETCOM.PAS
Type:   File
Description:  This file contains the procedures which handle all
              processing associated with getting a valid command
              from the user. It is called by the program and
              operation is maintained here until
              a decoded and validated command is entered.
Procedures Contained: get_cmd
Version:           3.1
Date:              16 Aug 83
Author:       Vincent M Parisi II, Capt, USAF
******************************************************************

******************************************************************
```

```
Name:   get_data
Type:   Procedure
Description:  This procedure reads the data.dat file and initial-
              izes the program variables passed to it.
Global Variables Used:     blanks,   call_routine,  status_line,
                           msg_dir,  decode_dict,   printer,
                           trans,    temp,          crt,
                           show_abbreviation,       in_terminal,
                           stat_on,  macro_error,   help_level,
                           list_dev_name,  trans_file_name,
                           macro_file_name
Global Variables Changed:  same as global variables
Global Constants Used:     term_length,  screen_width, num_words,
                           printer_length, num_msg_dir, num_ptrs
Passed Variables:  term_dat,   print_dat,  msg_dir,  printer,
                   decode_dict,  trans,  temp,  crt,  stat_on,
                   show_abbreviation, in_terminal,  macro_error,
                   help_level,  list_dev_name,  trans_file_name,
                   macro_file_name
Returned:          all passed variables are changed except
                   term_dat and print_dat
Files Written:     printer.out,   transact.ion,    macro.inp,
                   temp.out
Files Read:        help.sys,    microwsdw.sys
Aliases:           None
Procedures Called: clear,       title_slide,      bld_stat_line,
Called By:         icecappc

Version:           4.0
Date:              22 Jul 85
Author:       Vincent M Parisi II, Capt, USAF
Modified by:  Susan K. Mashiko, Capt, USAF
              Gary C. Tarczynski, Capt, USAF
Contained In File:   GETDAT.PAS
*******************************************************************

*******************************************************************
Name:   GETDAT.PAS
Type:   File
Description:  This file reads the data file from the disk and inserts
              it into the appropriate tables in the main program. It
              also initializes the flags and help_level and displays
              the titleslide.
Procedures Contained: title_slide,     bld_stat_line,    get_data
Version:           4.0
Date:              22 Jul 85
Author:       Vincent M Parisi II, Capt, USAF
Modified by:  Susan K. Mashiko, Capt, USAF
              Gary C. Tarczynski, Capt, USAF
```

```
*****************************************************************

*****************************************************************
Name:   get_fact
Type:   Procedure
Description:  This procedure gets the factored form of the poly-
              nomial.
Global Variables Used:     abort_command
Global Variables Changed:  None
Global Constants Used:     as_assigned
Passed Variables:  poly,           row,          abort_command
Returned:          poly
Files Read:        None
Files Written:     None
Aliases:           None
Procedures Called: make_pretty,    get_r_num,     gotoxy,
                   out_real,       disp_msg,      pause,
                   clear_msg
Called By:         poly

Version:           2.2
Date:              8 Sep 85
Author:       Vincent M Parisi II, Capt, USAF
Modified by: Susan K. Mashiko, Capt, USAF
              Gary C. Tarczynski, Capt, USAF
Contained In File:   GETTF.PAS
*****************************************************************

*****************************************************************
Name:   GETINT.PAS
Type:   File
Description:  This file handles the input of integers. Normal
              program integer input does not have edit capabilities
              to exclude inputs such as letters. This procedure only
              accepts valid input.
Procedures Contained:  del_1st_ch,   ck_chr,   out_int,
                       get_int,      get_chi
Version:           1.3
Date:              18 Oct 83
Author:       Vincent M Parisi II, Capt, USAF
*****************************************************************

*****************************************************************
Name:   get_int
Type:   Procedure
Description:  This procedure handles the input of integers. Normal
              program integer input does not have edit capabilities
              to exclude inputs such as letters. This procedure only
              accepts valid input.
```

```
Global Variables Used:     strng,  abort_command
Global Variables Changed:  strng,  abort_command
Global Constants Used:     as_assigned
Passed Variables:  number,     abort_command
Returned:          number,     abort_command
Files Read:        None
Files Written:     None
Aliases:           None
Procedures Called: get_strng
Called By:         gettf,   getmat,    chgmat,   delroot,   form,
                   get_poly

Version:           1.3
Date:              18 Oct 83
Author:      Vincent M Parisi II, Capt, USAF
Contained In File:   GETINT.PAS
******************************************************************

******************************************************************
Name:   GETLINE.PAS
Type:   File
Description:  This procedure builds a decoded entry from the record
              pointed to on entry. The pointers come from the ptrs
              part of dict_buffer and the word comes from the words
              part of the dict_buffer.
Procedures Contained: get_line
Version:           3.0
Date:              17 Jul 83
Author:      Vincent M Parisi II, Capt, USAF
******************************************************************

******************************************************************
Name:   get_line
Type:   Procedure
Description:  This procedure builds a decoded entry from the record
              pointed to on entry. The pointers come from the ptrs
              part of dict_buffer and the word comes fro the words
              part of the dict_buffer.
Global Variables Used:     blanks
Global Variables Changed:  None
Global Constants Used:     wordsize,   word_length
Passed Variables:  decode,     rec_num
Returned:          None
Files Read:        dict_file
Files Written:     None
Aliases:           None
Procedures Called: None
Called By:         get_cmd,    prompt_help,    val_n_dec
```

```
Version:            3.0
Date:               17 Jul 83
Author:      Vincent M Parisi II, Capt, USAF
Contained In File:   GETLINE.PAS
*******************************************************************

*******************************************************************
Name:   get_location
Type:   Procedure
Description:  This procedure determines the record location of the
              source and destination objects for the copy function.
Global Variables Used:     None
Global Variables Changed:  None
Global Constants Used:     None
Passed Variables:  location,    rec_loc,      type_move
Returned:          rec_loc,     type_move
Files Read:        None
Files Written:     None
Aliases:           None
Procedures Called: None
Called By:         ccopyy

Version:           2.0
Date:              4 Sep 85
Author:      Vincent M. Parisi II, Capt, USAF
Modified by: Susan K. Mashiko, Capt, USAF
             Gary C. Tarczynski, Capt, USAF
Contained In File:   COPY.PAS
*******************************************************************

*******************************************************************
Name:   getmat
Type:   Procedure
Description:  This procedure will get a matrix and store it.
Global Variables Used:     matrix,    abort_command
Global Variables Changed:  matrix
Global Constants Used:     as_assigned,  max_cols,   max_rows,
                           crt_only
Passed Variables:  def_obj
Returned:          None
Files Read:        MATRIX.DAT
Files Written:     None
Aliases:           None
Procedures Called: out_string,   pause,   clear,
                   gotoxy,       get_int, get_matrix_entries,
                   disp_msg,     clear_msg,
                   make_pretty_large_matrix_one
                   make_pretty_small_matrix
Called By:         define
```

```
Version:            1.0
Date:               11 Sep 85
Author:        Susan K. Mashiko, Capt, USAF
               Gary C. Tarczynski, Capt, USAF
Contained In File:   GETMAT.PAS
******************************************************************

******************************************************************
Name:   get_matrix_entries
Type:   Procedure
Description:  This procedure will get a matrix entry.
Global Variables Used:     abort_command
Global Variables Changed:  None
Global Constants Used:     None
Passed Variables:  matrix,   abort_command
Returned:          matrix
Files Read:        None
Files Written:     None
Aliases:           None
Procedures Called: get_r_num,   pause,   clear,
                   make_pretty_large_matrix_two
Called By:         getmat

Version:            1.0
Date:               11 Sep 85
Author:        Susan K. Mashiko, Capt, USAF
               Gary C. Tarczynski, Capt, USAF
Contained In File:   GETMAT.PAS
******************************************************************

******************************************************************
Name:   get_matrx_name
Type:   Procedure
Description:  This procedure will get the name of a matrix from
              the screen.
Global Variables Used:     blanks,   abort_command
Global Variables Changed:  blanks
Global Constants Used:     as_assigned,    crt_only
Passed Variables:  mat_name,     row,    col,    abort_command
Returned:          None
Files Read:        None
Files Written:     None
Aliases:           None
Procedures Called: highlight,   nohighlight,   gotoxy,
                   out_string,  ucase,         clear_msg,
                   get_strng,   disp_msg,      pause
Called By:         mmatrix

Version:            1.0
```

```
Date:               20 Sep 85
Author:        Susan K. Mashiko, Capt, USAF
               Gary C. Tarczynski, Capt, USAF
Contained In File:   MMATRIX.PAS
*****************************************************************

*****************************************************************
Name:   GETMAT.PAS
Type:   File
Description:  This file contains the procedure that will get a
              matrix and store it.
Procedures Contained:  left_bracket,  right_bracket,   get_mat,
                       make_pretty_large_matrix_one,
                       make_pretty_large_matrix_two,
                       make_pretty_small_matrix,  get_matrx_entries,
Version:            1.0
Date:               12 Sep 85
Author:        Susan K. Mashiko, Capt, USAF
               Gary C. Tarczynski, Capt, USAF
*****************************************************************

*****************************************************************
Name:   get_poly
Type:   Procedure
Description:  This procedure will get a polynomial in either the
              factored or the poly form.
Global Variables Used:     abort_command
Global Variables Changed:  None
Global Constants Used:     as_assigned,    crt_only
Passed Variables:  def_obj,   method
Returned:           None
Files Read:         None
Files Written:      TF&POLS.DAT
Aliases:            None
Procedures Called: clear,      gotoxy,   disp_msg,  out_string,
                   get_int,    disppoly, trim,      pause
Called By:          define

Version:            1.0
Date:               28 Sep 85
Author:        Susan K. Mashiko, Capt, USAF
               Gary C. Tarczynski, Capt, USAF
Contained In File:   DEFINE.PAS
*****************************************************************

*****************************************************************
Name:   get_poly_name
Type:   Procedure
Description:  This procedure will get the name of a polynomial form
```

```
            the screen.
Global Variables Used:     blanks,  abort_command
Global Variables Changed:  None
Global Constants Used:     as_assigned,    crt_only
Passed Variables:  poly_name,   row,    col,   abort_command
Returned:          poly_name
Files Read:        None
Files Written:     None
Aliases:           None
Procedures Called: highlight,   nohighlight,   gotoxy,   out_string,
                   ucase,       trim,          pause,
                   get_strng,   disp_msg,      clear_msg
Called By:         ppoly

Version:           1.0
Date:              6 Sep 85
Author:        Susan K. Mashiko, Capt, USAF
               Gary C. Tarczynski, Capt, USAF
Contained In File:   POLY.PAS
*****************************************************************

*****************************************************************
Name:   get_real
Type:   Procedure
Description:  This procedure gets a real number from the user. The
              procedure checks the validity of the input number.
              This prevents in inadvertant exit to the operating
              system.
Global Variables Used:     abort_command,   strng
Global Variables Changed:  abort_command,  strng
Global Constants Used:     as_assigned
Passed Variables:  number,        abort_command
Returned:          number
Files Read:        None
Files Written:     None
Aliases:           None
Procedures Called: get_string,     gotoxy,         pause,
                   disp_msg,       clear_msg,      highlight,
                   out_string,     nohighlight
Called By:         get_r_num

Version:           1.0
Date:              19 Aug 85
Author:        Susan K. Mashiko, Capt, USAF
               Gary C. Tarczynski, Capt, USAF
Contained In File:   REALS.PAS
*****************************************************************

*****************************************************************
```

```
Name:   get_r_num
Type:   Procedure
Description:  This procedure gets a real number from the user. The
              procedure checks the validity of the input number.
              This prevents in inadvertant exit to the operating
              system. Additionally this procedure will provide a
              prompt on row 20, and will provide an error message
              is there is something wrong with the input. The user
              must pass the row and the col of the desired location
              of the real number.
Global Variables Used:     blanks,    abort_command
Global Variables Changed:  blanks
Global Constants Used:     as_assigned,   crt_only
Passed Variables:  number,        abort_command,     row,    col
Returned:          number
Files Read:        None
Files Written:     None
Aliases:           None
Procedures Called: out_real,       gotoxy,
                   highlight,      get_real,
                   out_string,     nohighlight,
Called By:         get_fact,       get_unfact,   mmatrix,
                   get_matrx_entries,  chgmat,   inroot

Version:           1.2
Date:              20 Aug 85
Author:      Vincent M. Parisi II, Capt, USAF
Modified by: Susan K. Mashiko, Capt, USAF
             Gary C. Tarczynski, Capt, USAF
Contained In File:   GETTF.PAS
******************************************************************

******************************************************************
Name:   GETSTRIN.PAS
Type:   File
Description:  This file gets the ASCII input from terminal
              keyboard or the macro command file as specified in
              the input parameter. Collects characters until a
              <CR>.
Procedures Contained:  get_strng
Version:             2.0
Date:                28 Aug 83
Author:      Vincent M Parisi II, Capt, USAF
******************************************************************

******************************************************************
Name:   get_strng
Type:   Procedure
Description:  This procedure gets the ASCII input from terminal
```

```
                 keyboard or the macro command file as specified in
                 the input parameter. Collects characters unitl a
                 <CR>.
Global Variables Used:     in_terminal,  macro_file,  strng,
                           abort_command
Global Variables Changed:  strng,   abort_command
Global Constants Used:     screen_width,   abort_str
Passed Variables:  strng,   abort_command,    in_dev,
                   chr1,    chr2
Returned:          strng,   abort_command
Files Read:        None
Files Written:     None
Aliases:           None
Procedures Called: None
Called By:         get_int,      readcom,       recover,
                   update,       get_real,      chgmat,
                   get_poly_name,   get_matrx_name

Version:           2.0
Date:              28 Aug 83
Author:        Vincent M Parisi II, Capt, USAF
Contained In File:   GETSTRIN.PAS
*******************************************************************

*******************************************************************
Name:   gettf
Type:   Procedure
Description:  This procedure gets the transfer function in either
              polynomial or factored form.
Global Variables Used:     abort_command
Global Variables Changed:  abort_command
Global Constants Used:     crt_only,     as_assigned,   max_deg
Passed Variables:  def_obj,     method
Returned:          None
Files Read:        TF&POLS.DAT
Files Written:     None
Aliases:           None
Procedures Called: clear,     gotoxy,      disp_msg,
                   out_string, get_int,    clear_msg,
                   trim,        poly,      disptf,
                   pause
Called By:         define

Version:           3.0
Date:              25 Sep 85
Author:        Vincent M. Parisi II, Capt, USAF
Modified by:   Susan K. Mashiko, Capt, USAF
               Gary C. Tarczynski, Capt, USAF
Contained In File:   GETTF.PAS
```

```
*****************************************************************

*****************************************************************
Name:   GETTF.PAS
Type:   File
Description:  This file gets the transfer function in either
              polynomial or factored form.
Procedures Contained:  get_r_num,   make_pretty,   get_fact,
                       form_poly,   roots,         get_unfact,
                       poly,        gettf

Version:           3.0
Date:              25 Sep 85
Author:        Vincent M. Parisi II, Capt, USAF
Modified by:   Susan K. Mashiko, Capt, USAF
               Gary C. Tarczynski, Capt, USAF
*****************************************************************

*****************************************************************
Name:   get_unfact
Type:   Procedure
Description:  This procedure gets the unfactored form of the poly-
              nomial.
Global Variables Used:     abort_command
Global Variables Changed:  None
Global Constants Used:     as_assigned
Passed Variables:  poly,          row,          abort_command
Returned:          poly
Files Read:        None
Files Written:     None
Aliases:           None
Procedures Called: make_pretty,   get_r_num,    gotoxy,
                   out_real,      disp_msg,     pause,
                   clear_msg
Called By:         poly

Version:           2.0
Date:              25 Sep 85
Author:        Vincent M Parisi II, Capt, USAF
Modified by:   Susan K. Mashiko, Capt, USAF
               Gary C. Tarczynski, Capt, USAF
Contained In File:   GETTF.PAS
*****************************************************************

*****************************************************************
Name:     gnpol
Aliases:  None
Type Of Entry: Variable
Description:  Variable is a polynomial, numerator of the feed
```

```
                forward transfer function.
Make_up:        Polynomial
Source:
Destination:
Used In:        form
*******************************************************************

*******************************************************************
Name:   gotoxy
Type:   Procedure
Description:  This procedure places the cursor at the x and y
              coordinates passed to it. It is capable of sending
              an initial string of characters either the row or
              column then an intermediate string of char, the
              other address and finally a trailing string of char
              if required. Offsets if any are added prior to sending
              the row/col
Global Variables Used:     term
Global Variables Changed:  None
Global Constants Used:     term_length
Passed Variables:  row : integer; col : integer
Returned:          None
Files Read:        None
Files Written:     None
Aliases:           None
Procedures Called: ttype
Called By:         clear,          rectangle,         pause,
                   title_slide,    disp_msg,          prompt_help,
                   prompt_cmd,     proces_error,      get_cmd,
                   get_real        get_r_num,         recover,
                   update,         ccopyy,            make_pretty,
                   roots,          gettf,             get_fact,
                   get_unfact,     left_bracket,      right_bracket,
                   getmat,         matrxadd,          mmatrxmlt,
                   matrxinv,       disptf,            chgmat,
                   disppoly,       inroot,            delroot,
                   form,           disp_matrx,        mmatrix,
                   polymlt,        get_poly_name,     ppoly,
                   get_poly,       make_pretty_small_matrix,
                   make_pretty_large_matrix_one,
                   get_matrx_name

Version:           2.0
Date:              21 Oct 83
Author:          Vincent M Parisi II, Capt, USAF
Modifier:        Paul A. Moore, Capt, USAF
Contained In File:   TERMINAL.PAS
*******************************************************************
```

```
******************************************************************
Name:   graphics
Type:   Procedure
Description:  This procedure places the terminal in graphics mode.
Global Variables Used:     term
Global Variables Changed:  None
Global Constants Used:     term_length
Passed Variables:  None
Returned:          None
Files Read:        None
Files Written:     None
Aliases:           None
Procedures Called:
Called By:         rectangle,    make_pretty,  left_bracket,
                   right_bracket

Version:           2.0
Date:              21 Oct 83
Author:      Vincent M Parisi II, Capt, USAF
Contained In File:   TERMINAL.PAS
******************************************************************

******************************************************************
Name:      hdpol
Aliases:   None
Type Of Entry: Variable
Description:   Variable is a polynomial, denominator of the feedback
               transfer function.
Make_up:       Polynomial
Source:
Destination:
Used In:       form
******************************************************************

******************************************************************
Name:      height
Aliases:   None
Type Of Entry: Variable
Description:   Variable is the desired height in rows of the
               rectangle.
Make_up:       Integer
Source:
Destination:
Used In:       rectangle
******************************************************************

******************************************************************
Name:   help
Type:   Procedure
```

```
Description:  This procedure handles the logic for providing on
              line help. The valid command is scanned to determine
              what help is requested. The display message routine is
              then called with the correct number of the message
              desired.
Global Variables Used:     cmdbuffer
Global Variables Changed:  None
Global Constants Used:     wordsize,   buffersize
Passed Variables:  cmdbuffer,   wordnumber
Returned:          None
Files Read:        None
Files Written:     None
Aliases:           None
Procedures Called: pause,   clear,    disp_msg,     trim,
Called By:         select_routine

Version:           2.0
Date:              18 Sep 85
Author:       Vincent M Parisi II, Capt, USAF
Modified by:  Susan K. Mashiko, Capt, USAF
              Gary C. Tarczynski, Capt, USAF
Contained In File:   HELP.PAS
******************************************************************

******************************************************************
Name:       help
Aliases:    None
Type Of Entry: Char
Description:   Variable that is used to insert in the status line,
               it indicates the help level of the system.
Make_up:       Char
Source:        bld_stat_line
Destination:
Used In:       bld_stat_line
******************************************************************

******************************************************************
Name:       help_level
Aliases:    None
Type Of Entry: Global file variable and data flow
Description:   Variable indicates the amount of help the user wants
               in the operation of the program.
Make_up:       Integer
Source:        Declared in icecappc
Destination:
Used In:       icecappc,    bld_stat_line,   get_cmd,
               proces_error, get_data
******************************************************************
```

```
******************************************************************
Name:      help_obj
Aliases:   None
Type Of Entry: Variable
Description:   This variable is the object of the command help. It
               is passed to other procedures.
Make_up:       cmdword
Source:
Destination:
Used In:       help
******************************************************************

******************************************************************
Name:   HELP.PAS
Type:   File
Description:  This file handles the logic for providing on
              line help. The valid command is scanned to determine
              what help is requested. The display message routine is
              then called with the correct number of the message
              desired.
Procedure Contained:   help
Version:           2.0
Date:              18 Sep 85
Author:       Vincent M Parisi II, Capt, USAF
Modified by: Susan K. Mashiko, Capt, USAF
             Gary C. Tarczynski, Capt, USAF
******************************************************************

******************************************************************
Name:      HELP.SYS
Type :     Data
Description:   This file is created by the program builddat, and is
               in turn used by the procedure get_data for initial-
               ization.
Used In:       get_data
******************************************************************

******************************************************************
Name:   highlight
Type:   Procedure
Description:  This procedure places the terminal in reverse video
              mode.
Global Variables Used:     term
Global Variables Changed:  None
Global Constants Used:     term_length
Passed Variables:  None
Returned:          None
Files Read:        None
Files Written:     None
```

```
Aliases:             None
Procedures Called:
Called By:           highlight,     title_slide,    prompt_cmd
                     proces_error,  get_r_num,      ccopyy,
                     get_real,      roots,          delroot,
                     polymlt,       form,           get_poly_name,
                     get_matrx_name

Version:             2.0
Date:                21 Oct 83
Author:       Vincent M Parisi II, Capt, USAF
Contained In File:     TERMINAL.PAS
*******************************************************************

*******************************************************************
Name:         hnpol
Aliases:      None
Type Of Entry: Variable
Description:   Variable is a polynomial, the numerator of the feed
               back transfer function.
Make_up:       Polynomial
Source:
Destination:
Used In:       form
*******************************************************************

*******************************************************************
Name:         i
Aliases:      None
Type Of Entry: Variable
Description:   This variable is used as a counter.
Make_up:       Integer
Source:        Same as the procedure that uses it
Destination:
Used In:       ucase,        gotoxy,         graphics,
               clear,        nographics,     clearscreen,
               highlight,    nohighlight,    videolow,
               svideolow,    videobold,      svideobold,
               rectangle,    disp_msg,       clear_msg,
               trim,         readcom,        check_word,
               get_cmd,      get_data,       recover,
               ccopyy,       make_pretty,    update,
               move_tf,      move_poly,      move_matrix,
               get_real,     gettf,          get_fact,
               get_unfact,   roots,          left_bracket,
               matrxsub,     right_bracket, get_matrx_entries,
               getmat,       matrxadd,       mmatrxmlt,
               polymanip,    polymanip2,     dispmatrx,
               matrxmanipl,  polysub,        smatrxmlt,
                    matrxmanip2,  matrxtran,     matrxinv,
                    disppoly,     get_poly,      disptf,
                    chgmat,       inroot,        delroot,
                    spolymlt,     polymlt,       polyadd,
                    make_pretty_small_matrix,    select_routine,
                    make_pretty_large_matrix_one, proces_error
*****************************************************************

*****************************************************************
Name:   icecappc
Type:   Main program
Description:  This file contains the main program for the MICROSDW men
              system and the icecappc subroutines. There are four
              different versions: IBM-PC, IBM with hard drive, Z-100,
              Z-100 with hard drive.
Global Variables Used:     None
Global Variables Changed:  None
Global Constants Used:     None
Passed Variables:  None
Returned:          None
Files Read:        None
Files Written:     None
Aliases:           None
Procedures Called: get_cmd,   get_data,  select_routine
                   (IBM version - standard_output)
Called By:         N/A

Version:
Date:
Author:      Susan K. Mashiko, Capt, USAF
             Gary C. Tarczynski, Capt, USAF
Contained In File:   ICECAPPC.PAS
*****************************************************************

*****************************************************************
Name:      imag_root
Aliases:   None
Type Of Entry: Variable
Description:   This variable is used as the temporary storage area
               for the imaginary root.
Make_up:       Real
Source:
Destination:
Used In:       roots
*****************************************************************

*****************************************************************
Name:      in_dev
Aliases:   None
```

```
Type Of Entry: Variable and data flow
Description:   This parameter indicates to get_strng which device
               is to be used for input.
Make_up:       char
Source:        get_strng
Destination:
Used In:       get_strng
*******************************************************************

*******************************************************************
Name:   inroot
Type:   Procedure
Description:  This procedure will insert a root into a polynomial.
              If the root is complex the conjugate will also be
              inserted.
Global Variables Used:     cmdbuffer, abort_command
Global Variables Changed:  None
Global Constants Used:     crt_only,   as_assigned
Passed Variables:  cmdbuffer,   wordnumber
Returned:          None
Files Read:        TF&POLS.DAT
Files Written:     TF&POLS.DAT
Aliases:           None
Procedures Called: clear,    gotoxy,    disppoly,   trim,
                   out_real, out_string, get_r_num, out_int,
                   form_poly, pause
Called By:         modify

Version:           2.0
Date:              19 Sep 85
Author:       Susan K. Mashiko, Capt, USAF
              Gary C. Tarczynski, Capt, USAF
Contained In File:   INROOT.PAS
*******************************************************************

*******************************************************************
Name:   INROOT.PAS
Type:   File
Description:  This file will insert a root into a polynomial.
              If the root is complex the conjugate will also be
              inserted.
Procedures Contained:   inroot
Version:           2.0
Date:              19 Sep 85
Author:       Susan K. Mashiko, Capt, USAF
              Gary C. Tarczynski, Capt, USAF
*******************************************************************

*******************************************************************
```

```
Name:      instr_col
Aliases:   None
Type Of Entry: Constant
Description:   This constant is the column location where instruc-
               tions for command entry begins.
Make_up:       Integer
Source:        get_cmd
Destination:   instruction
Used In:       get_cmd,    instruction
*******************************************************************

*******************************************************************
Name:      instr_row
Aliases:   None
Type Of Entry: Constant
Description:   This constant is the row location where instruc-
               tions for command entry begins.
Make_up:       Integer
Source:        get_cmd
Destination:   instruction
Used In:       get_cmd,     instruction
*******************************************************************

*******************************************************************
Name:      instring
Aliases:   None
Type Of Entry: Variable
Description:   This variable is used as a string.
Make_up:       msg_line
Source:        ucase
Destination:
Used In:       ucase,  svideobold,   svideolow
*******************************************************************

*******************************************************************
Name:   instruction
Type:   Procedure
Description:  This procedure issues the appropriate instructions
              for entering a command based on the number of
              command words already entered.
Global Variables Used:     None
Global Variables Changed:  None
Global Constants Used:     None
Passed Variables:  level,  instr_row,   instr_col
Returned:          None
Files Read:        None
Files Written:     None
Aliases:           None
Procedures Called: out_string
```

```
Called By:          get_cmd

Version:            1.1
Date:               16 Aug 83
Author:      Vincent M Parisi II, Capt, USAF
Contained In File:   INSTRUC.PAS
*******************************************************************

*******************************************************************
Name:   INSTRUC.PAS
Type:   File
Description:  This file issues the appropriate instructions
              for entering a command based on the number of
              command words already entered.
Procedures Contained:  instruction
Version:            1.1
Date:               16 Aug 83
Author:      Vincent M Parisi II, Capt, USAF
*******************************************************************

*******************************************************************
Name:      in_terminal
Aliases:   None
Type Of Entry: Global variable and data flow
Description:   This variable indicates whether the input should come
               from the terminal keyboard or the macrofile.
Make_up:       Boolean
Source:        Declared in icecappc
Destination:
Used In:       icecappc,    get_strng,     getdata
*******************************************************************

*******************************************************************
Name:      iteration
Aliases:   None
Type Of Entry: Variable
Description:   This variable is the counter for the number of
               iterations the procedure roots goes thru before the
               root is found.
Make_up:       Integer
Source:
Destination:
Used In:       roots
*******************************************************************

*******************************************************************
Name:      j
Aliases:   None
Type Of Entry: Variable
```

```
Description:   Generally set up as a counter.
Make_up:       integer
Source:
Destination:
Used In:       prompt_help,  readcom,  matrxadd,  matrxsub,
               get_matrix_entries,  smatrxmlt,  mmatrxmlt,
               matrxinv,  matrxinv,  matrxtran,  chgmat,
               polymlt
*****************************************************************

*****************************************************************
Name:      k
Aliases:   None
Type Of Entry: Variable
Description:   Generally set up as a counter.
Make_up:       integer
Source:
Destination:
Used In:       roots
*****************************************************************

*****************************************************************
Name:      l
Aliases:   None
Type Of Entry: Variable
Description:   Used as a counter.
Make_up:       Integer
Source:
Destination:
Used In:       mmatrxmlt
*****************************************************************

*****************************************************************
Name:      L1
Aliases:   None
Type Of Entry: Variable
Description:   line + height - 1
Make_up:       integer
Source:        rectangle
Destination:
Used In:       rectangle
*****************************************************************

*****************************************************************
Name:      last_rec_num
Aliases:   None
Type Of Entry: Variable
Description:   This variable is the number of the last record in
               the file.
```

```
Make_up:       Integer
Source:
Destination:
Used In:       val_n_dec
******************************************************************

******************************************************************
Name:    left_bracket
Type:    Procedure
Description:  This procedure draws the left bracket around a matrix
              displayed on the terminal.
Global Variables Used:     term
Global Variables Changed:  None
Global Constants Used:     None
Passed Variables:  num_rows
Returned:          None
Files Read:        None
Files Written:     None
Aliases:           None
Porcedures called:  graphics,  gotoxy,  nographics
Called by:    make_pretty_small_matrix,  make_pretty_large_matrix_one,
              make_pretty_large_matrix_two

Version:           1.0
Date:              11 Sep 85
Author:       Susan K. Mashiko, Capt, USAF
              Gary C. Tarczynski, Capt, USAF
Contained In File:   GETMAT.PAS
******************************************************************

******************************************************************
Name:       lencmd
Aliases:    None
Type Of Entry: Variable
Description:   This variable is the length of the command line that
               was input by the user.
Make_up:       Integer
Source:        readcom
Destination:
Used In:       readcom
******************************************************************

******************************************************************
Name:       length
Aliases:    None
Type Of Entry: Variable
Description:   This variable is the length of the message to be
               displayed or erased.
Make_up:       Integer
```

```
Source:
Destination:
Used In:        disp_msg,    clear_msg
*******************************************************************

*******************************************************************
Name:      level
Aliases:   None
Type Of Entry: Variable and data flow
Description:    This variable indicates which iteration through the
                recursive val_n_dec procedure a fault occured. Thus
                it indicates which word in the command buffer is
                causing problems and allows prompts based on that
                word/position.
Make_up:        Integer
Source:         get_cmd,       val_n_dec
Destination:
Used In:        get_cmd,       instruction,        val_n_dec
                proces_error
*******************************************************************

*******************************************************************
Name:      line
Aliases:   None
Type of Entry: Variable
Description:    This variable indicates which row should be the top
                of the rectangle.
Make_up:        Integer
Source:
Destination:
Used In:        retangle
*******************************************************************

*******************************************************************
Name:      list_dev
Aliases:   None
Type Of Entry: Global file variable
Description:    Logical file - when output is to this 'file' the
                output is written to a file 'PRINTER.OUT'
Make_up:        TEXT
Source:         Declared in icecappc
Destination:
Used In:        get_data,      out_string,         out_int
*******************************************************************

*******************************************************************
Name:      list_dev_name
Aliases:   None
Type Of Entry: Global file variable
```

```
Description:   This variable is not used in icecappc
Make_up:
Source:        Declared in icecappc
Destination:
Used In:       icecappc,   get_data
*******************************************************************

*******************************************************************
Name:      location
Aliases:   None
Type Of Entry: Variable
Description:   This variable is passed internal to the file Copy.
               It is the object that is to be copied.
Make_up:       cmdword
Source:
Destination:
Used In:       get_location
*******************************************************************

*******************************************************************
Name:      logo
Aliases:   None
Type Of Entry: Constant
Description:   This constant is word or phrase printed on the CRT
               to prompt the user for a command.
Make_up:       Char
Source:
Destination:
Used In:       prompt_cmd
*******************************************************************

*******************************************************************
Name:      m
Aliases:   None
Type Of Entry: Variable
Description:   Generally set up as a counter.
Make_up:       integer
Source:
Destination:
Used In:       roots
*******************************************************************

*******************************************************************
Name:      macro_error
Aliases:   None
Type Of Entry: Global variable
Description:   This variable is the flag that indicates whether
               an error has occured while getting input from the
               macro command file.
```

```
Make_up:        Boolean
Source:         Declared in icecappc
Destination:
Used In:        icecappc,       readcom,        get_data
*******************************************************************

*******************************************************************
Name:      macro_file
Aliases:   None
Type Of Entry: Global variable
Description:    File of text that contains the commands and data
                input as macro commands for non-interactive program
                use.
Make_up:        Text
Source:         Declared in icecappc
Destination:
Used In:        get_data,       get_strng
*******************************************************************

*******************************************************************
Name:            macro_file_name
Aliases:         None
Type Of Entry:   Global variable
Description:     The name of the text file that contains the commands
                 and data input as macro commands for non-interactive
                 program use.
Make_up:       Paramstring
Source:        Declared in icecappc
Destination:
Used In:       icecappc,       get_data
*******************************************************************

*******************************************************************
Name:    MACRO.INP
Type:    Text
Description:  This file contains the command and the data input for
              the non_interactive mode of ICECAP-PC.
Used In:  get_data
*******************************************************************

*******************************************************************
Name:   make_pretty
Type:   Procedure
Description:  This procedure pretties up the screen for transfer
              function input.
Global Variables Used:     term,   degree
Global Variables Changed:  None
Global Constants Used:     crt_only,   screen_width,   as_assigned
Passed Variables:  row,    degree
```

```
Returned:           None
Files Read:         None
Files Written:      None
Aliases:            None
Procedures Called: gotoxy,    disp_msg,   graphics,    nographics,
                   put_string, out_int
Called By:         get_fact,   get_unfact,   disptf,   disppoly

Version:            2.3
Date:               26 Aug 85
Author:       Vincent M Parisi II, Capt, USAF
Modified by: Susan K. Mashiko, Capt, USAF
             Gary C. Tarczynski, Capt, USAF
Contained In File:   GETTF.PAS
*****************************************************************

*****************************************************************
Name:   make_pretty_large_matrix_one
Type:   Procedure
Description:  This procedure will draw the left bracket and place
              row and col numbers on the first display screen of
              a matrix with more than 5 cols.
Global Variables Used:     None
Global Variables Changed:  None
Global Constants Used:     crt_only,    as_assigned
Passed Variables:  num_row,   num_col
Returned:          None
Files Read:        None
Files Written:     None
Aliases:           None
Procedures Called: gotoxy,    out_string,   out_int,
                   left_bracket
Called By:         getmat,  disp_matrx, chgmat, get_matrix_entries

Version:           1.0
Date:              11 Sep 85
Author:       Susan K. Mashiko, Capt, USAF
              Gary C. Tarczynski, Capt, USAF
Contained In File:   GETMAT.PAS
*****************************************************************

*****************************************************************
Name:   make_pretty_large_matrix_two
Type:   Procedure
Description:  This procedure will draw the right bracket of a
              matrix with more than 5 columns. It will also write
              the col and row identifiers on the screen.
Global Variables Used:     None
Global Variables Changed:  None
Global Constants Used:     crt_only,    as_assigned
Passed Variables:  num_row,   num_col
Returned:          None
Files Read:        None
Files Written:     None
Aliases:           None
Procedures Called: gotoxy,    out_string,   out_int,
                   left_bracket
Called By:         getmat,  disp_matrx, chgmat, get_matrix_entries

Version:           1.0
Date:              11 Sep 85
Author:        Susan K. Mashiko, Capt, USAF
               Gary C. Tarczynski, Capt, USAF
Contained In File:   GETMAT.PAS
*******************************************************************

*******************************************************************
Name:   make_pretty_small_matrix
Type:   Procedure
Description:  This procedure will draw the brackets and label the
              cols and rows for a matrix with 5 cols or less.
Global Variables Used:     None
Global Variables Changed:  None
Global Constants Used:     crt_only,    as_assigned
Passed Variables:  num_row,   num_col
Returned:          None
Files Read:        None
Files Written:     None
Aliases:           None
Procedures Called: gotoxy,    out_string,   out_int,
                   left_bracket,   right_bracket
Called By:         getmat,   disp_matrx,   chgmat

Version:           1.0
Date:              11 Sep 85
Author:        Susan K. Mashiko, Capt, USAF
               Gary C. Tarczynski, Capt, USAF
Contained In File:   GETMAT.PAS
*******************************************************************

*******************************************************************
Name:      mat
Aliases:   None
Type Of Entry: Variable
Description:   This is a matrix.
Make_up:       matrix
Source:
Destination:
```

```
Used In:       recover,      update,    chgmat,    disp_matrx
*******************************************************************

*******************************************************************
Name:     mat1
Aliases:  None
Type Of Entry: Variable
Description:   This is a temporary matrix that is used to pass
               matrices between procedures.
Make_up:       matrix
Source:
Destination:
Used In:       matrxmanip1,   matrxmanip2
*******************************************************************

*******************************************************************
Name:     mat2
Aliases:  None
Type Of Entry: Variable
Description:   This is a temporary matrix that is used to pass
               matrices between procedures.
Make_up:       matrix
Source:
Destination:
Used In:       matrxmanip1,   matrxmanip2
*******************************************************************

*******************************************************************
Name:     mat3
Aliases:  None
Type Of Entry: Variable
Description:   This is a temporary matrix that is used to pass
               matrices between procedures.
Make_up:       matrix
Source:
Destination:
Used In:       matrxmanip1
*******************************************************************

*******************************************************************
Name:     mata
Aliases:  None
Type Of Entry: Variable
Description:   This is a file of matrix.
Make_up:       file of matrix
Source:
Destination:
Used In:       recover,      update
*******************************************************************
```

```
*******************************************************************
Name:       mat_file
Aliases:    None
Type Of Entry: Variable
Description:   This is a file of matrix.
Make_up:       file of matrix
Source:
Destination:
Used In:       move_matrix
*******************************************************************

*******************************************************************
Name:       mat_name
Aliases:    None
Type Of Entry: Variable
Description:   This is the matrix name.
Make_up:       msg_line
Source:
Destination:
Used In:       mmatrix
*******************************************************************

*******************************************************************
Name:       mat_obj
Aliases:    None
Type Of Entry: Variable
Description:   This variable is used to indicate the object that
               the called routine is to operate with.
Make_up:       cmdword
Source:
Destination:
Used In:       matrxmanip2,     mmatrix
*******************************************************************

*******************************************************************
Name:       matrices
Aliases:    None
Type Of Entry: Variable
Description:   This is a file of matrix.
Make_up:       msg_line
Source:
Destination:
Used In:       getmat
*******************************************************************

*******************************************************************
Name:       matrix
Aliases:    None
Type Of Entry: Type definition
```

```
Description:   This is the record definition for a file of matrix.
Make_up:       matrix  =  record
                 num_rows   : integer;
                 num_cols   : integer;
                 element    : array[ 1..max_rows, 1..mac_cols ]
                              of real;
                 end;
Source:        Declared in concons
Destination:
Used In:       recover,       update,       move_matrix,
               matrxmanip1,  matrxmanip2,  disp_matrx
               matrxtran,    matrxinv,     chgmat,
               get_matrx_entries, matrxsub,  smatrxmlt,
               getmat,        matrxadd,     mmatrxmlt
*******************************************************************

*******************************************************************
Name:   MATRIX.PAS
Type:   File
Description:  This file will decode the command string from
              define.pas and call the appropriate procedures.
Procedures Contained:  disp_matrx,    matrx_manip1,  matrx_manip2,
                       get_matrx_name,  mmatrix
Version:          1.0
Date:             22 Sep 85
Author:         Susan K. Mashiko, Capt, USAF
                Gary C. Tarczynski, Capt, USAF
*******************************************************************

*******************************************************************
Name:      matrx
Aliases:   None
Type Of Entry: Variable
Description:   This is a matrix.
Make_up:       matrix
Source:
Destination:
Used In:       move_matrix
*******************************************************************

*******************************************************************
Name:   MATRXMAN.PAS
Type:   File
Description:  This file contains the matrix manipulation procedures.
Procedures Contained:  matrxadd,   mmatrxmlt,   matrxsub,
                       smatrxsub,  matrxtran,   matrxinv
Version:          1.0
Date:             22 Sep 85
Author:         Susan K. Mashiko, Capt, USAF
```

```
                Gary C. Tarczynski, Capt, USAF
******************************************************************

******************************************************************
Name:   matrxadd
Type:   Procedure
Description:  This procedure will add two matrices together and
              store the result in the third matrix passed to
              the procedure.
Global Variables Used:     abort_command
Global Variables Changed:  abort_command
Global Constants Used:     None
Passed Variables:  amat,   bmat,   cmat,   abort_command
Returned:          cmat,   abort_command
Files Read:        None
Files Written:     None
Aliases:           None
Procedures Called: clear,   gotoxy,   pause,   disp_msg
Called By:         matrxsub,   matrxmanip1

Version:           1.0
Date:              18 Sep 85
Author:         Susan K. Mashiko, Capt, USAF
                Gary C. Tarczynski, Capt, USAF
Contained In File:   MATRXMAN.PAS
******************************************************************

******************************************************************
Name:   matrxinv
Type:   Procedure
Description:  This procedure will invert a matrix and place the
              result in the second matrix passed to it.
Global Variables Used:     abort_command
Global Variables Changed:  None
Global Constants Used:     None
Passed Variables:  amat,   bmat,   abort_command
Returned:          amat,   bmat,   abort_command
Files Read:        None
Files Written:     None
Aliases:           None
Procedures Called: clear,   gotoxy,   pause,   disp_msg
Called By:         matrxmanip2

Version:           1.0
Date:              18 Sep 85
Author:         Susan K. Mashiko, Capt, USAF
                Gary C. Tarczynski, Capt, USAF
Contained In File:   MATRXMAN.PAS
******************************************************************
```

```
*******************************************************************
Name:   matrx_manipl
Type:   Procedure
Description:  This procedure add, subtract and multiply two matrices.
Global Variables Used:     abort_command
Global Variables Changed:  None
Global Constants Used:     None
Passed Variables:  first,   second,   third,   mat_obj
Returned:          third
Files Read:        MATRIX.DAT
Files Written:     MATRIX.DAT
Aliases:           None
Procedures Called: trim,   disp_matrx,   matrxadd,   mmatrxmlt,
                   matrxsub
Called By:         mmatrix

Version:           1.0
Date:              21 Sep 85
Author:      Susan K. Mashiko, Capt, USAF
             Gary C. Tarczynski, Capt, USAF
Contained In File:   MATRIX.PAS
*******************************************************************

*******************************************************************
Name:   matrx_manip2
Type:   Procedure
Description:  This procedure invert,  transpose, or multiply a
              matrix by a scalar.
Global Variables Used:     abort_command
Global Variables Changed:  None
Global Constants Used:     None
Passed Variables:  first,   number,   result,   mat_obj
Returned:          result
Files Read:        MATRIX.DAT
Files Written:     MATRIX.DAT
Aliases:           None
Procedures Called: trim,   disp_matrx,   matrxinv,   smatrxmlt,
                   matrxtran
Called By:         mmatrix

Version:           1.0
Date:              21 Sep 85
Author:      Susan K. Mashiko, Capt, USAF
             Gary C. Tarczynski, Capt, USAF
Contained In File:   MATRIX.PAS
*******************************************************************

*******************************************************************
Name:   matrxsub
```

```
Type:   Procedure
Description:  This procedure will subtract the second matrix from
              the the first and store it in the third.
Global Variables Used:     abort_command
Global Variables Changed:  abort_command
Global Constants Used:     None
Passed Variables:  amat,   bmat,   cmat,   abort_command
Returned:          cmat,   abort_command
Files Read:        None
Files Written:     None
Aliases:           None
Procedures Called: matrxadd
Called By:         matrxmanip1

Version:           1.0
Date:              20 Sep 85
Author:         Susan K. Mashiko, Capt, USAF
                Gary C. Tarczynski, Capt, USAF
Contained In File:   MATRXMAN.PAS
*******************************************************************

*******************************************************************
Name:   matrxtran
Type:   Procedure
Description:  This procedure will transpose a matrix and pass it
              in the second matrix passed to it.
Global Variables Used:     None
Global Variables Changed:  None
Global Constants Used:     None
Passed Variables:  amat,   bmat
Returned:          amat,   bmat
Files Read:        None
Files Written:     None
Aliases:           None
Procedures Called: None
Called By:         matrxmanip2

Version:           1.0
Date:              18 Sep 85
Author:         Susan K. Mashiko, Capt, USAF
                Gary C. Tarczynski, Capt, USAF
Contained In File:   MATRXMAN.PAS
*******************************************************************

*******************************************************************
Name:      mats
Aliases:   None
Type Of Entry: Variable
Description:   This is a file of matrix.
```

```
Make_up:        file of matrix
Source:
Destination:
Used In:        recover,      update,     matrxmanip1,
                matrxmanip2,  disp_matrx, getmat,
                chgmat
******************************************************************

******************************************************************
Name:       max_cols
Aliases:    None
Type Of Entry: Global constant
Description:    This is the maximum number of columns a matrix may
                have.
Make_up:        Integer
Source:         Declared in concons
Destination:
Used In:        matrix,    getmat
******************************************************************

******************************************************************
Name:       max_deg
Aliases:    None
Type Of Entry: Global constant
Description:    This is the maximum degree of the polynomials.
Make_up:        Integer
Source:         Declared in concons
Destination:
Used In:        polynomial,   gettf,    get_poly
******************************************************************

******************************************************************
Name:       max_deg1
Aliases:    None
Type Of Entry: Global constant
Description:    This is the maximum degree of the polynomials plus
                one.
Make_up:        Integer
Source:         Declared in concons
Destination:
Used In:        polynomial
******************************************************************

******************************************************************
Name:       max_rows
Aliases:    None
Type Of Entry: Global constant
Description:    This is the maximum number of rows allowed in a
                matrix.
```

```
Make_up:        Integer
Source:         Declared in concons
Destination:
Used In:        matrix,    getmat
**************************************************************

**************************************************************
Name:     method
Aliases:  None
Type Of Entry: Variable
Description:    This is the method by which the polynomial will be
                entered, either poly or factored form.
Make_up:        cmdword
Source:
Destination:
Used In:        poly,    gettf,    get_poly
**************************************************************

**************************************************************
Name:   mmatrix
Type:   Procedure
Description:  This procedure will decode the command string from
              define.pas and all the appropriate procedures.
Global Variables Used:     abort_command,   cmdbuffer
Global Variables Changed:  abort_command
Global Constants Used:     as_assigned
Passed Variables:  cmdbuffer,   wordnumber
Returned:          None
Files Read:        None
Files Written:     None
Aliases:           None
Procedures Called: pause,  clear,   matrxmanip2,   get_matrx_name,
                   get_r_num,   gotoxy,  out_string,   disp_matrx,
                   trim,   disp_msg,   matrxmanipl
Called By:         disp

Version:           1.0
Date:              19 Sep 85
Author:        Susan K. Mashiko, Capt, USAF
               Gary C. Tarczynski, Capt, USAF
Contained In File:   MATRIX.PAS
**************************************************************

**************************************************************
Name:   mmatrxmlt
Type:   Procedure
Description:  This procedure will multiply the second matrix to
              the the first and store it in the third.
Global Variables Used:     abort_command
Global Variables Changed:  abort_command
Global Constants Used:     None
Passed Variables:  amat,   bmat,   cmat,   abort_command
Returned:          cmat,   abort_command
Files Read:        None
Files Written:     None
Aliases:           None
Procedures Called: clear,  gotoxy,   pause,   disp_msg
Called By:         matrxmanipl

Version:           1.0
Date:              18 Sep 85
Author:      Susan K. Mashiko, Capt, USAF
             Gary C. Tarczynski, Capt, USAF
Contained In File:   MATRXMAN.PAS
******************************************************************

******************************************************************
Name:   modify
Type:   Procedure
Description:  This procedure contains the logic to decide which
              modification procedure should be called and calls
              it.
Global Variables Used:     cmdbuffer
Global Variables Changed:  None
Global Constants Used:     None
Passed Variables:  cmdbuffer,   wordnumber
Returned:          None
Files Read:        None
Files Written:     None
Aliases:           None
Procedures Called: inroot,  delroot,  chgmat,   clear,   trim,
                   disp_msg,  pause
Called By:         select_routine

Version:           1.0
Date:              22 Sep 85
Author:      Susan K. Mashiko, Capt, USAF
             Gary C. Tarczynski, Capt, USAF
Contained In File:   MODIFY.PAS
******************************************************************

******************************************************************
Name:   MODIFY.PAS
Type:   File
Description:  This file contains the logic to decide which
              modification procedure should be called and calls
              it.
Procedures Contained:  chgmat,   modify
```

```
Version:            1.0
Date:               22 Sep 85
Author:       Susan K. Mashiko, Capt, USAF
              Gary C. Tarczynski, Capt, USAF
*******************************************************************

*******************************************************************
Name:      mod_msg
Aliases:   None
Type Of Entry: Variable
Description:   This is the number of the message for the modifiy
               command.
Make_up:       Integer
Source:
Destination:
Used In:       help
*******************************************************************

*******************************************************************
Name:      mod_obj
Aliases:   None
Type Of Entry: Variable
Description:   This variable is used to indicate the object that
               the called routine is to operate with.
Make_up:       cmdword
Source:
Destination:
Used In:
*******************************************************************

*******************************************************************
Name:   move_matrix
Type:   Procedure
Description:  This procedure receives the source and destination
              matrix locations, reads the source matrix location
              and copies it to the destination.
Global Variables Used:     None
Global Variables Changed:  None
Global Constants Used:     None
Passed Variables:  sorce,   dest_loc
Returned:          None
Files Read:        TF&POLS.DAT
Files Written:     TF&POLS.DAT
Aliases:           None
Procedures Called: None
Called By:         ccopyy

Version:           2.0
Date:              4 Sep 85
```

```
Author:      Vincent M Parisi II, Capt, USAF
Modifeid by: Susan K. Mashiko, Capt, USAF
             Gary C. Tarczynski, Capt, USAF
Contained In File:   COPY.PAS
*****************************************************************

*****************************************************************
Name:   move_poly
Type:   Procedure
Description:  This procedure receives the source and destination
              poly locations, reads the source poly location
              and copies it to the destination.
Global Variables Used:     None
Global Variables Changed:  None
Global Constants Used:     None
Passed Variables:  sorce,    dest_loc
Returned:          None
Files Read:        TF&POLS.DAT
Files Written:     TF&POLS.DAT
Aliases:           None
Procedures Called: None
Called By:         ccopyy

Version:           2.0
Date:              4 Sep 85
Author:      Vincent M Parisi II, Capt, USAF
Modifeid by: Susan K. Mashiko, Capt, USAF
             Gary C. Tarczynski, Capt, USAF
Contained In File:   COPY.PAS
*****************************************************************

*****************************************************************
Name:   move_tf
Type:   Procedure
Description:  This procedure receives the source and destination
              tf locations, reads the source tf location
              and copies it to the destination.
Global Variables Used:     None
Global Variables Changed:  None
Global Constants Used:     None
Passed Variables:  sorce,    dest_loc
Returned:          None
Files Read:        TF&POLS.DAT
Files Written:     TF&POLS.DAT
Aliases:           None
Procedures Called: None
Called By:         ccopyy

Version:           2.0
```

```
Date:               4 Sep 85
Author:      Vincent M Parisi II, Capt, USAF
Modifeid by: Susan K. Mashiko, Capt, USAF
             Gary C. Tarczynski, Capt, USAF
Contained In File:   COPY.PAS
*******************************************************************

*******************************************************************
Name:              MSDWCONS.PAS
Type:              File of constants
Description:       This file contains the constant definitions for the
                   MICROSDW ans ICECAPPC routines
Global Variables Used:
Global Variables Changed:
Global Constants Used:
Passed Variables:
Returned:
Files Read:
Files Written:
Aliases:
Procedures Called:
Called By:

Version:     4.0
Date:        19 September 85
Author:      Paul A Moore, Capt, USAF
Modifiers:   Susan K. Mashiko, Capt, USAF
             Gary C. Tarczynski, Capt, USAF
Contained In File: MSDWCONS.PAS
*******************************************************************

*******************************************************************
Name:              MSDWTYPE.PAS
Type:              File of type definitions
Description:       This file contains the type definitions for the
                   MICROSDW and ICECAPPC routines
Global Variables Used:
Global Variables Changed:
Global Constants Used:
Passed Variables:
Returned:
Files Read:
Files Written:
Aliases:
Procedures Called:
Called By:

Version:     4.0
Date:        19 September 85
```

```
Author:       Paul A Moore, Capt, USAF
Modifiers:    Susan K. Mashiko, Capt, USAF
              Gary C. Tarczynski, Capt, USAF
Contained In File: MSDWTYPE.PAS
*******************************************************************

*******************************************************************
Name:            msg
Aliases:         None
Type Of Entry:   Global type definition
Description:     Type definition of the structure that contains
                 the message record number and length in number of
                 records.
Make_up:      msg  =  record
                loc_rec     : integer;
                length      : byte;
                end;
Source:       Declared in msdwtype
Destination:
Used In:      msdwtype
*******************************************************************

*******************************************************************
Name:            msg_array
Aliases:         None
Type Of Entry:   Global type definition
Description:     This is the type definition of the structure that
                 contains the message directory.
Make_up:      array[ 1..num_msg_dir ] of msg
Source:       Declared in icecappc
Destination:
Used In:      icecappc,    get_data
*******************************************************************

*******************************************************************
Name:            msg_dat
Aliases:         None
Type Of Entry:   Global type definition
Description:     Type definition of one line from the file of the
                 message text.
Make_up:      msg_dat  =  array[ 1..num_msg_line ] of string[ screen
                          width ]
Source:       Declared in msdwtype
Destination:
Used In:
*******************************************************************

*******************************************************************
Name:        msg_dir
```

```
Aliases:   None
Type Of Entry: Global variable and data flow
Description:   This is the message directory that contains the
               record number of the messages in the HELP.TXT file.
               It also is a counter for the total number of messages
               in HELP.TXT
Make_up:       msg_array
Source:        Declared in icecappc
Destination:
Used In:       icecappc,        disp_msg,       clear_msg,
               get_data
******************************************************************

******************************************************************
Name:           msg_line
Aliases:        None
Type Of Entry:  Global type definition
Description:    This is the type definition of a long string
                which can then be used as a parameter for passing
                between procedures.
Make_up:       string[ screen_width ]
Source:        Declared in icecappc
Destination: N/A
Used In:       icecappc,        ucase,          out_string,
               get_strng,       recover,        update,
               ck_chr,          get_poly_name, svideobold,
               svideolow
******************************************************************

******************************************************************
Name:       msg_num
Aliases:    None
Type Of Entry: Variable
Description:   This variable is the number of the message from the
               message file that will either be displayed or
               cleared.
Make_up:       Integer
Source:
Destination:
Used In:       disp_msg,        clear_msg
******************************************************************

******************************************************************
Name:   MSG.PAS
Type:   File
Description:   This file contains the procedures to display and to
               clear a message.
Procedures Contained:  disp_line,     disp_msg,     clear_msg
Version:   3.1
```

```
Date:       23 Aug 85
Author:     Vincent M. Parisi II, Capt, USAF
Modified by: Susan K. Mashiko, Capt, USAF
             Gary C. Tarczynski, Capt, USAF
*******************************************************************

*******************************************************************
Name:       msg_txt
Aliases:    None
Type Of Entry: Global accessed file
Description:   This is the file that contains the message text
               for display throughout the program. System warnings,
               instructions, error messages and help information is
               contained in this file.
Make_up:       file of msg_dat
Source:        Declared in icecappc
Destination:
Used In:       disp_line
*******************************************************************

*******************************************************************
Name:       n
Aliases:    None
Type Of Entry: Variable
Description:   Used as a counter.
Make_up:       Integer
Source:
Destination:
Used In:       polyadd
*******************************************************************

*******************************************************************
Name:       naa
Aliases:    None
Type Of Entry: Variable
Description:   Used as a counter.
Make_up:       Integer
Source:
Destination:
Used In:       polymlt
*******************************************************************

*******************************************************************
Name:       nbb
Aliases:    None
Type Of Entry: Variable
Description:   Used as a counter.
Make_up:       Integer
Source:
```

```
Destination:
Used In:       polymlt,  polysub
******************************************************************

******************************************************************
Name:      nbmat
Aliases:   None
Type Of Entry: Variable
Description:   File of matrix.
Make_up:       matrix
Source:
Destination:
Used In:       matrxsub
******************************************************************

******************************************************************
Name:      nbpoly
Aliases:   None
Type Of Entry: Variable
Description:   This is a storage location for the polynomial.
Make_up:       polynomial
Source:
Destination:
Used In:       polysub
******************************************************************

******************************************************************
Name:      nc
Aliases:   None
Type Of Entry: Variable
Description:   Used as a counter.
Make_up:       Integer
Source:
Destination:
Used In:       polyadd
******************************************************************

******************************************************************
Name:      ncc
Aliases:   None
Type Of Entry: Variable
Description:   Used as a counter.
Make_up:       Integer
Source:
Destination:
Used In:       polyadd
******************************************************************

******************************************************************
```

```
Name:      newpoly
Aliases:   None
Type Of Entry: Variable
Description:   This is a storage location for the polynomial after
               it has been modified.
Make_up:       polynomial
Source:
Destination:
Used In:       inroot,   delroot
******************************************************************

******************************************************************
Name:      nn
Aliases:   None
Type Of Entry: Variable
Description:   Used as a counter.
Make_up:       Integer
Source:
Destination:
Used In:       polyadd
******************************************************************

******************************************************************
Name:      no
Aliases:   None
Type Of Entry: Global constant
Description:   Boolean Variable
Make_up:       Boolean
Source:        Declared in icecappc
Destination:   N/A
Used In:
******************************************************************

******************************************************************
Name:   nographics
Type:   Procedure
Description:  This procedure removes the terminal from the graphics
              mode.
Global Variables Used:     term
Global Variables Changed:  None
Global Constants Used:     term_length
Passed Variables:  None
Returned:          None
Files Read:        None
Files Written:     None
Aliases:           None
Procedures Called:
Called By:         rectangle,  left_bracket,   right_bracket
```

```
Version:              2.0
Date:                 21 Oct 83
Author:         Vincent M Parisi II, Capt, USAF
Contained In File:   TERMINAL.PAS
******************************************************************

******************************************************************
Name:   nohighlight
Type:   Procedure
Description:  This procedure removes the terminal from the reverse
              video mode.
Global Variables Used:     term
Global Variables Changed:  None
Global Constants Used:     term_length
Passed Variables:   None
Returned:           None
Files Read:         None
Files Written:      None
Aliases:            None
Procedures Called:
Called By:          pause,        title_slide,        prompt_cmd,
                    proces_error,ccopyy,              get_r_num,
                    get_real,     make_pretty,        roots,
                    delroot,      form,               get_poly_name,
                    polymlt,      get_matrx_name

Version:              2.0
Date:                 21 Oct 83
Author:         Vincent M Parisi II, Capt, USAF
Contained In File:   TERMINAL.PAS
******************************************************************

******************************************************************
Name:      number
Aliases:   None
Type Of Entry: Variable
Description:   This is a variable
Make_up:       Real
Source:        Declared in icecappc
Destination:   N/A
Used In:       out_int,        get_int,          out_real,
               get_real,       get_r_num,        get_fact,
               get_unfact      spolymlt,         matrxmanip2,
               ppoly,          dispmatrx,        polymanip2,
               smatrxmlt,      get_matrix_entries, disptf,
               mmatrix,        getmat,           chgmat,
               disppoly,       inroot
******************************************************************
```

```
*******************************************************************
Name:           number_of_commands
Aliases:        None
Type Of Entry:  Data flow
Description:    The number of command words entered by the user,
                calculated by: bufferpointer - 1.
Make_up:      Integer
Source:       Declared in icecappc
Destination:
Used In:      icecappc,    select_routine
*******************************************************************

*******************************************************************
Name:           num_bools
Aliases:        None
Type Of Entry:  Global constant
Description:    The number of boolean variables within each
                parameter group.
Make_up:      Integer (10)
Source:       Declared in msdwcons
Destination:
Used In:      msdwtype
*******************************************************************

*******************************************************************
Name:           num_col
Aliases:        None
Type Of Entry:  Variable
Description:    This variable is the number of cols in a matrix.
Make_up:      Integer
Source:
Destination:
Used In:      disp_matrx,      chgmat,         getmat,
              make_pretty_large_matrix_one,    get_matrx_entries
*******************************************************************

*******************************************************************
Name:           num_cols
Aliases:        None
Type Of Entry:  Variable
Description:    This variable is the number of columns in a matrix.
Make_up:      Integer
Source:
Destination:
Used In:      left_bracket,  right_bracket
*******************************************************************

*******************************************************************
Name:           num_deg
```

```
Aliases:          None
Type Of Entry:    Variable
Description:      This variable is the degree of the numerator poly-
                  nomial.
Make_up:        Integer
Source:
Destination:
Used In:        gettf
*****************************************************************

*****************************************************************
Name:             numerator
Aliases:          None
Type Of Entry:    Variable
Description:      This variable is the numerator polynomial.
Make_up:        Polynomial
Source:
Destination:
Used In:        gettf,    disptf
*****************************************************************

*****************************************************************
Name:             num_ints
Aliases:          None
Type Of Entry:    Global constant
Description:      The number of integer variables within each
                  parameter group.
Make_up:        Integer (10)
Source:         Declared in msdwcons
Destination:
Used In:        msdwtype
*****************************************************************

*****************************************************************
Name:             num_msg_dir
Aliases:          None
Type Of Entry:    Global constant
Description:      The length of the message directory--i.e. the
                  HELP.TXT file is limited to this number of
                  messages.
Make_up:        Integer
Source:         Declared in msdwcons
Destination:
Used In:        msdwtype,        icecappc,        get_data
*****************************************************************

*****************************************************************
Name:             num_msg_line
Aliases:          None
```

```
Type Of Entry:  Global constant
Description:    The number of lines of message text available in
                the file.
Make_up:       Integer
Source:        Declared in msdwcons
Destination:
Used In:       msdwtype
*******************************************************************

*******************************************************************
Name:           num_of_commands
Aliases:        None
Type Of Entry:  Variable
Description:    The number of commands.
Make_up:       Integer
Source:        val_n_dec,    get_cmd
Destination:
Used In:       val_n_dec,    get_cmd
*******************************************************************

*******************************************************************
Name:           num_param_group
Aliases:        None
Type Of Entry:  Global constant
Description:    The number of parameter groups in the file
                MICROWSDW.SYS
Make_up:       Integer
Source:        Declared in msdwcons
Destination:
Used In:       msdwtype
*******************************************************************

*******************************************************************
Name:           num_ptr_recs
Aliases:        None
Type Of Entry:  Global constant
Description:    The number of pointers within each record of the
                command syntax data structure.
Make_up:       Integer
Source:        Declared in msdwcons
Destination:
Used In:       msdwtype
*******************************************************************

*******************************************************************
Name:           num_ptrs
Aliases:        None
Type Of Entry:  Global constant
Description:    The number of records with decoding information in
```

```
                  the command syntax structure. If the displayed menu
                  contains strange characters there may be insuffcent
                  num_ptrs.
Make_up:      Integer
Source:       Declared in msdwcons
Destination:
Used In:      msdwtype,        get_data
*****************************************************************

*****************************************************************
Name:             num_reals
Aliases:          None
Type Of Entry:    Global constant
Description:      The number of real variables within each parameter
                  group.
Make_up:      Integer
Source:       Declared in msdwcons
Destination:
Used In:      msdwtype
*****************************************************************

*****************************************************************
Name:             num_row
Aliases:          None
Type Of Entry:    Variable
Description:      This variable is the number of rows in a matrix.
Make_up:      Integer
Source:
Destination:
Used In:      disp_matrx,      chgmat,          getmat,
              make_pretty_large_matrix_one,     get_matrx_entries
*****************************************************************

*****************************************************************
Name:             num_rows
Aliases:          None
Type Of Entry:    Variable
Description:      This variable is the number of rows in a matrix.
Make_up:      Integer
Source:
Destination:
Used In:      left_bracket,  right_bracket
*****************************************************************

*****************************************************************
Name:             num_strings
Aliases:          None
Type Of Entry:    Global constant
Description:      The number of strings within each parameter
```

```
                 group.
Make_up:     Integer
Source:      Declared in msdwcons
Destination:
Used In:     msdwtype
*******************************************************************

*******************************************************************
Name:           num_words
Aliases:        None
Type Of Entry:  Global constant
Description:    The number of dictionary words in the command
                syntax data structure. If words are missing from
                your menu increasing this number should solve the
                problem.
Make_up:     Integer
Source:      Declared in msdwcons
Destination:
Used In:     msdwtype,      get_data
*******************************************************************

*******************************************************************
Name:           oldpoly
Aliases:        None
Type Of Entry:  Variable
Description:    This variable is the original polynomial before
                it is modified.
Make_up:     polynomial
Source:
Destination:
Used In:     inroot,   delroot
*******************************************************************

*******************************************************************
Name:           odpol
Aliases:        None
Type Of Entry:  Variable
Description:    This variable is the denominator polynomial of the
                OLTF.
Make_up:     polynomial
Source:
Destination:
Used In:     form
*******************************************************************

*******************************************************************
Name:           onpol
Aliases:        None
Type Of Entry:  Variable
```

```
Description:    This variable is the numerator polynomial of the
                OLTF.
Make_up:     polynomial
Source:
Destination:
Used In:     form
*******************************************************************

*******************************************************************
Name:           on_off
Aliases:        None
Type Of Entry:  Variable
Description:    This variable is displayed in the status line
                at the bottom of the screen.
Make_up:     Char
Source:      bld_stat_line
Destination:
Used In:     bld_stat_line
*******************************************************************

*******************************************************************
Name:           ostring
Aliases:        None
Type Of Entry:  Variable
Description:    The string the user wishes to output.
Make_up:     msg_line
Source:      out_string
Destination:
Used In:     out_string
*******************************************************************

*******************************************************************
Name:     out_int
Type:     Procedure
Description:  This procedure directs the output of integers.
Global Variables Used:     crt,       trans,        printer,
                           temp,      trans_file,   temp_file,
                           list_dev
Global Variables Changed:  temp_file,    trans_file,   list_dev
Global Constants Used:     None
Passed Variables:  number,      field,      dest
Returned:          None
Files Read:        None
Files Written:     temp_file,    trans_file,     list_dev,
                   temp.out,   transact.ion,    printer.out
Aliases:           None
Procedures Called:
Called By:         make_pretty,   inroot,
                   make_pretty_large_matrix_one,
                    make_pretty_small_matrix

Version:            1.2
Date:               18 Aug 83
Author:        Vincent M Parisi II, Capt, USAF
Contained In File:   GETINT.PAS
******************************************************************

******************************************************************
Name:      OUTPUT.PAS
Type:      File
Description:  This file contains the procedure that handles all of
              output.
Procedure Contained:  out_string
Version:        1.0
Date:           1 Aug 83
Author:         Vincent M Parisi II, Capt, USAF
******************************************************************

******************************************************************
Name:      out_real
Type:      Procedure
Description:  This procedure outputs real numbers to the crt or
              any of the required files.
Global Variables Used:      crt,  trans,  printer,  temp
                            list_dev
Global Variables Changed:  None
Global Constants Used:      None
Passed Variables:   number,    fieldwidth,     dest
Returned:           None
Files Read:         trans_file,   temp_file,   list_dev
Files Written:      printer.out,  temp.out,   transact.ion
Aliases:            None
Procedures Called:
Called By:          get_fact,     get_unfact,      get_r_num,
                    disptf,       chgmat,          inroot,
                    disppoly,     disp_matrx

Version:            1.4
Date:               2 Sep 83
Author:        Vincent M Parisi II, Capt, USAF
Contained In File:   REALS.PAS
******************************************************************

******************************************************************
Name:      out_string
Type:      Procedure
Description:  This procedure handles all string output for the pro-
              gram. Whenever system output is required, this module
```

```
                   is called, the output is directed to the appropriate
                   device. ( crt, printer, transaction, temporary )
Global Variables Used:     trans, printer, temp,  crt,  list_dev,
                           trans_file,  temp_file
Global Variables Changed:  None
Global Constants Used:     None
Passed Variables:  ostring,  dest
Returned:          None
Files Read:        trans_file, temp_file,  list_dev
Files Written:     printer.out,  transact.ion,   temp.out
Aliases:           None
Procedures Called:
Called By:         pause,          clear_msg,       disp_line,
                   instruction,    prompt_help,     prompt_cmd,
                   displa_commandword, recover,     update,
                   ccopyy,         get_real,        get_r_num,
                   make_pretty,    gettf,           get_poly,
                   getmat,         get_poly_name,   disptf,
                   chgmat,         ppoly,           inroot,
                   delroot,        mmatrix,         form,
                   disppoly,   make_pretty_large_matrix_one,
                   disp_matrx, make_pretty_small_matrix,
                   disp,   get_matrx_name

Version:           1.0
Date:              1 Aug 83
Author:        Vincent M Parisi II, Capt, USAF
Contained In File:   OUTPUT.PAS
*****************************************************************

*****************************************************************
Name:            param_group
Aliases:         None
Type Of Entry:   Global type definition
Description:     Type definition of the structure that contains the
                 program's parameters which are used throughout the
                 program.
Make_up:       param_group  =  record
                 bools   : array[ 1..num_bools ] of boolean;
                 ints    : array[ 1..num_ints ] of integer;
                 reals   : array[ 1..num_reals ] of reals;
                 strings : array[ 1..num_strings ] of paramstring;
                 end;
Source:        Declared in msdwtype
Destination:
Used In:       icecappc,    msdwtype
*****************************************************************

*****************************************************************
```

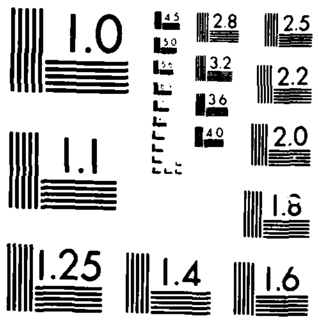
```
Name:            paramstring
Aliases:         None
Type Of Entry:   Global type definition
Description:     Type definition of a fourteen char string to be
                 used thruout the program.
Make_up:      paramstring = string[ 14 ]
Source:       Declared in msdwtype
Destination:
Used In:      get_data
*******************************************************************

*******************************************************************
Name:      pause
Type:      Procedure
Description:  This procedure waits for user response to continue
              anytime there is a stop in the program.
Global Variables Used:      blanks,      status_line,   stat_on
Global Variables Changed:   None
Global Constants Used:      screen_width, crt_only, stat_line_width
Passed Variables:  None
Returned:          None
Files Read:        None
Files Written:     None
Aliases:           None
Procedures Called: gotoxy,        highlight,        nohighlight,
                   out_string
Called By:         proces_error,  recover,          update.
                   ccopyy,        help,             get_real,
                   get_fact,      matrxadd,         get_matrx_entries,
                   mmatrxmlt,    disptf,           getmat,
                   matrxinv,      define,           modify,
                   chgmat,        dispmatrx,        inroot,
                   delroot,       mmatrix,          form
                   polymanip,     polymanip2,       get_poly_name,
                   get_matrx_name,  get_poly,       disp,
                   select_routine

Version:           1.1
Date:              29 Oct 84
Author:       Vincent M Parisi II, Capt, USAF
Modified by: Paul A Moore, Capt, USAF
Contained In File:   PAUSE.PAS
*******************************************************************

*******************************************************************
Name:      PAUSE.PAS
Type:      File
Description:  This file waits for user response to continue
              anytime there is a stop in the program.
```

```
Procedures Contained: pause
Version:             1.1
Date:                29 Oct 84
Author:        Vincent M Parisi II, Capt, USAF
Modified by: Paul A Moore, Capt, USAF
*******************************************************************

*******************************************************************
Name:       pi
Aliases:    None
Type Of Entry: Constant
Description:   This is the value of pi.
Make_up:       real
Source:
Destination:
Used In:
*******************************************************************

*******************************************************************
Name:       pol
Aliases:    None
Type Of Entry: Variable
Description:   This is a polynomial.
Make_up:       polynomial.
Source:
Destination:
Used In:       recover,   update,   disppoly,   get_poly,
               poly_into_storage,   poly_from_storage
*******************************************************************

*******************************************************************
Name:       poll
Aliases:    None
Type Of Entry: Variable
Description:   This is a polynomial.
Make_up:       polynomial.
Source:
Destination:
Used In:       polymanip,  polymanip2
*******************************************************************

*******************************************************************
Name:       pol2
Aliases:    None
Type Of Entry: Variable
Description:   This is a polynomial.
Make_up:       polynomial.
Source:
Destination:
```

AD-A164 044 DEVELOPMENT OF A COMPUTER AIDED DESIGN PACKAGE FOR CONTROL SYSTEM DESIGN A..(U) AIR FORCE INST OF TECH WRIGHT-PATTERSON AFB OH SCHOOL OF ENGI..

2/5

UNCLASSIFIED S K MASHIKO ET AL. DEC 85 F/G 9/2 NL



MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS 1963-A

```
Used In:        polymanip,  polymanip2
*******************************************************************

*******************************************************************
Name:      pol3
Aliases:   None
Type Of Entry: Variable
Description:   This is a polynomial.
Make_up:       polynomial.
Source:
Destination:
Used In:       polymanip
*******************************************************************

*******************************************************************
Name:      pola
Aliases:   None
Type Of Entry: Variable
Description:   This is a file of polynomial.
Make_up:       file of polynomial.
Source:
Destination:
Used In:       recover,    update
*******************************************************************

*******************************************************************
Name:      pol_deg
Aliases:   None
Type Of Entry: Variable
Description:   This is a the degree of the polynomial.
Make_up:       Integer
Source:
Destination:
Used In:       get_poly
*******************************************************************

*******************************************************************
Name:      pols
Aliases:   None
Type Of Entry: Variable
Description:   This is a file of polynomial.
Make_up:       file of polynomial.
Source:
Destination:
Used In:       recover,    update
*******************************************************************

*******************************************************************
Name:      poly
```

```
Aliases:   None
Type Of Entry: Variable
Description:   This is a polynomial.
Make_up:       polynomial.
Source:
Destination:
Used In:       poly,      roots,     get_unfact,
               form_poly, get_fact,  move_tf,
               move_poly
*******************************************************************

*******************************************************************
Name:     poly
Type:     Procedure
Description:  This procedure gets a polynomial in either factored
              or poly form.
Global Variables Used:     abort_command
Global Variables Changed:  None
Global Constants Used:     None
Passed Variables:  method,    poly,      disp_row,
                   abort_command
Returned:          poly
Files Read:        None
Files Written:     None
Aliases:           None
Procedures Called: get_unfact,    get_fact,
                   roots,         form_poly
Called By:         gettf

Version:           1.2
Date:              25 Sep 85
Author:      Vincent M Parisi II, Capt, USAF
Modified by: Susan K. Mashiko, Capt, USAF
             Gary C. Tarczynski, Capt, USAF
Contained In File:   GETTF.PAS
*******************************************************************

*******************************************************************
Name:     polyadd
Type:     Procedure
Description:  This procedure will add the second polynomial
              to the first and store it in the third.
Global Variables Used:     polynomial
Global Variables Changed:  polynomial
Global Constants Used:     None
Passed Variables:  apoly,   bpoly,   cpoly
Returned:          apoly,   bpoly,   cpoly
Files Read:        None
Files Written:     None
```

```
Aliases:            None
Procedures Called: roots
Called By:          polymanip,   polysub

Version:            2.0
Date:               18 Sep 85
Author:        Susan K. Mashiko, Capt, USAF
               Gary C. Tarczynski, Capt, USAF
Contained In File:   POLYMAN.PAS
*******************************************************************

*******************************************************************
Name:       poly_file
Aliases:    None
Type Of Entry: Variable
Description:   This a file of polynomial.
Make_up:       polynomial
Source:
Destination:
Used In:       move_poly
*******************************************************************

*******************************************************************
Name:      poly_from_storage
Type:      Procedure
Description:  This procedure will remove a polynomial into storage.
Global Variables Used:      None
Global Variables Changed:  None
Global Constants Used:      None
Passed Variables:  choice,  pol
Returned:           None
Files Read:         TF&POLS.DAT
Files Written:      None
Aliases:            None
Procedures Called: trim
Called By:          form

Version:            1.0
Date:               7 Oct 85
Author:        Susan K. Mashiko, Capt, USAF
               Gary C. Tarczynski, Capt, USAF
Contained In File:   FORM.PAS
*******************************************************************

*******************************************************************
Name:      poly_into_storage
Type:      Procedure
Description:  This procedure will place a polynomial into storage.
Global Variables Used:      None
Global Variables Changed:  None
Global Constants Used:     None
Passed Variables:  choice,  pol
Returned:          None
Files Read:        None
Files Written:     TF&POLS.DAT
Aliases:           None
Procedures Called: trim
Called By:         form

Version:           1.0
Date:              7 Oct 85
Author:      Susan K. Mashiko, Capt, USAF
             Gary C. Tarczynski, Capt, USAF
Contained In File:   FORM.PAS
******************************************************************

******************************************************************
Name:     polymanip
Type:     Procedure
Description:  This procedure will add, subtract, or multiply two
              polynomials.
Global Variables Used:     polynomial
Global Variables Changed:  None
Global Constants Used:     None
Passed Variables:  first,    second,    result
Returned:          result
Files Read:        TF&POLS.DAT
Files Written:     TF&POLS.DAT
Aliases:           None
Procedures Called: trim,    disppoly,    polyadd,    polymlt,
                   polysub,  pause
Called By:         ppoly

Version:           1.0
Date:              6 Sept 85
Author:      Susan K. Mashiko, Capt, USAF
             Gary C. Tarczynski, Capt, USAF
Contained In File:   POLY.PAS
******************************************************************

******************************************************************
Name:     polymanip2
Type:     Procedure
Description:  This procedure will multiply a polynomial and a scalar.
Global Variables Used:     polynomial
Global Variables Changed:  None
Global Constants Used:     None
Passed Variables:  first,    number,    result,    poly_obj
```

```
Returned:           result
Files Read:         None
Files Written:      None
Aliases:            None
Procedures Called:  trim,    disppoly,   spolymlt
Called By:          ppoly

Version:            1.0
Date:               8 Oct 85
Author:         Susan K. Mashiko, Capt, USAF
                Gary C. Tarczynski, Capt, USAF
Contained In File:   POLY.PAS
*****************************************************************

******************************************************************
Name:       POLYMAN.PAS
Type:       File
Description:  This file will add, subtract, or multiply two
              polynomials. Additionally, it will multipy a
              polynomial by a scalar.
Procedures Contained:  polyadd,   polymlt,   polysub,  spolymlt
Version:             3.0
Date:                8 Oct 85
Author:         Susan K. Mashiko, Capt, USAF
                Gary C. Tarczynski, Capt, USAF
******************************************************************

******************************************************************
Name:       polymlt
Type:       Procedure
Description:  This procedure will multiply the second polynomial
              to the first and store it in the third.
Global Variables Used:     polynomial
Global Variables Changed:  polynomial
Global Constants Used:     None
Passed Variables:   apoly,   bpoly,   cpoly
Returned:           cpoly
Files Read:         None
Files Written:      None
Aliases:            None
Procedures Called:  roots,    clear,    gotoxy,     highlight,
                    nohighlight
Called By:          polymanip,  form

Version:            1.0
Date:               4 Sep 85
Author:         Susan K. Mashiko, Capt, USAF
                Gary C. Tarczynski, Capt, USAF
Contained In File:   POLYMAN.PAS
```

```
*******************************************************************

*******************************************************************
Name:       poly_name
Aliases:    None
Type Of Entry: Variable
Description:   This variable is the name of polynomial obtained by
               this procedure.
Make_up:       msg_line
Source:
Destination:
Used In:       ppoly,   get_poly_name
*******************************************************************

*******************************************************************
Name:       polynomial
Aliases:    None
Type Of Entry: Global type definition
Description:   Record that contains the components of a polynomial.
Make_up:       polynomial = record
                 change      : boolean;
                 coefficient : real;
                 polydeg     : integer;
                 polyfact    : array[ 1..max_deg ] of complex;
                 polypoly    : array[ 1..maxdegl ] of real;
                 end;
Source:        Declared in concons
Destination:
Used In:       poly,       roots,      get_unfact,  get_poly,
               form_poly, get_fact,   move_tf,     polymanip,
               move_poly, gettf,      recover,     polymanip2,
               update,    polyadd,    polysub,     spolymlt,
               disptf,    disppoly,   inroot,      delroot,
               ppoly,     get_poly_name, poly_from_storage,
               poly_into_storage,  form,   polymlt
*******************************************************************

*******************************************************************
Name:       poly_obj
Aliases:    None
Type Of Entry: Variable
Description:   This variable is the name of polynomial passed to
               this procedure.
Make_up:       cmdword
Source:
Destination:
Used In:       ppoly,   polymanip
*******************************************************************
```

```
******************************************************************
Name:      POLY.PAS
Type:      File
Description:  This file contains the procedures to display and
              manipulate polynomials.
Procedures Contained:  disppoly,   polymanip,   ppoly,
                       get_poly_name,  polymanip2
Version:          3.0
Date:             8 Oct 85
Author:        Susan K. Mashiko, Capt, USAF
               Gary C. Tarczynski, Capt, USAF
******************************************************************

******************************************************************
Name:      polys
Aliases:   None
Type Of Entry: Variable
Description:   This is a file of polynomial.
Make_up:       file of polynomial.
Source:
Destination:
Used In:       gettf,  disptf,  poly_into_storage,
               inroot,  delroot, poly_from_storage,
               polymanip, polymanip2,  disppoly,  get_poly
******************************************************************

******************************************************************
Name:      polysub
Type:      Procedure
Description:  This procedure will subtract the second polynomial
              form the first and store it in the third.
Global Variables Used:     polynomial
Global Variables Changed:  polynomial
Global Constants Used:     None
Passed Variables:  apoly,   bpoly,   cpoly
Returned:          cpoly
Files Read:        None
Files Written:     None
Aliases:           None
Procedures Called: polyadd
Called By:         polymanip

Version:           1.0
Date:              4 Sep 85
Author:        Susan K. Mashiko, Capt, USAF
               Gary C. Tarczynski, Capt, USAF
Contained In File:   POLYMAN.PAS
******************************************************************
```

```
******************************************************************
Name:      pos
Aliases:   None
Type Of Entry: Variable
Description:   This a the passed position.
Make_up:       Integer
Source:
Destination:
Used In:       svideolow,   svideobold
******************************************************************

******************************************************************
Name:     ppoly
Type:     Procedure
Description:  This procedure will get the name of a polynomial from
              the screen.
Global Variables Used:     abort_command, cmdbuffer
Global Variables Changed:  None
Global Constants Used:     as_assigned
Passed Variables:  cmdbuffer,  wordnumber
Returned:          None
Files Read:        None
Files Written:     None
Aliases:           None
Procedures Called: clear,   disp_msg,  trim,   disppoly,
                   get_poly_name,  gotoxy,  out_string,
                   polymanip,  get_r_num,   polymanip2,
                   pause
Called By:         disp

Version:           2.0
Date:              19 Sep 85
Author:        Susan K. Mashiko, Capt, USAF
               Gary C. Tarczynski, Capt, USAF
Contained In File:   POLY.PAS
******************************************************************

******************************************************************
Name:       pr_cmd_col
Aliases:    None
Type Of Entry: Constant definition and data flow
Description:   This is the column location that the logo appears
               at.
Make_up:       Integer
Source:        get_cmd
Destination:
Used In:       get_cmd
******************************************************************
```

```
*******************************************************************
Name:      pr_cmd_row
Aliases:   None
Type Of Entry: Constant definition and data flow
Description:   This is the row location that the logo appears
               at.
Make_up:       Integer
Source:        get_cmd
Destination:
Used In:       get_cmd
*******************************************************************

*******************************************************************
Name:      pr_hlp_row
Aliases:   None
Type Of Entry: Constant definition and data flow
Description:   This is the row location that the command word
               prompt appears on.
Make_up:       Integer
Source:        get_cmd
Destination:
Used In:       get_cmd
*******************************************************************

*******************************************************************
Name:      print
Aliases:   None
Type Of Entry: Global file variable and data flow
Description:   This is an array that contains the printer control
               codes.
Make_up:       print_array
Source:        Declared in icecappc
Destination:
Used In:       icecappc
*******************************************************************

*******************************************************************
Name:       print_array
Aliases:    None
Type Of Entry:  Type definition
Description:    This is the type declaration of the global variable
                that contains the printer's control codes.
Make_up:       array[ 1..printer_length ] of byte
Source:        Declared in icecappc
Destination:   N/A
Used In:       icecappc,       get_data
*******************************************************************

*******************************************************************
```

```
Name:      print_dat
Aliases:   None
Type Of Entry: Variable
Description:   This variable is of the type print_array.
Make_up:       print_array
Source:
Destination:
Used In:       get_data
*******************************************************************

*******************************************************************
Name:      print_line
Aliases:   None
Type Of Entry: Variable
Description:   This is the variable name for output line.
Make_up:       string[ screen_width ]
Source:        disp_line
Destination:
Used In:       disp_line
*******************************************************************

*******************************************************************
Name:      print_msg
Aliases:   None
Type Of Entry: Variable
Description:   This variable is the message number for help on the
               print command.
Make_up:       Integer
Source:
Destination:
Used In:       help
*******************************************************************

*******************************************************************
Name:      printer
Aliases:   None
Type Of Entry: Global variable
Description:   This variable is the flag that indicates whether
               the printer file is on. i.e. should all printer
               directed output be saved in the printer file.
Make_up:       Boolean
Source:        Declared in icecappc
Destination:
Used In:       icecappc,     out_string,   out_int,
               bld_stat_line, get_data,    out_real
*******************************************************************

*******************************************************************
Name:          printer_length
```

```
Aliases:         None
Type Of Entry:   Global constant
Description:     This is the length of the array for printer control
                 codes.
Make_up:       Integer
Source:        Declared in msdwcons
Destination:
Used In:       icecappc,      msdwtype,       get_data
*******************************************************************

*******************************************************************
Name:       PRINTER.OUT
Type:       File
Description:  This file contains the output for the printer. It
              will only be filled if printer is true.
Used In:    get_data
*******************************************************************

*******************************************************************
Name:       print_line
Aliases:    None
Type Of Entry: Variable
Description:    This a the line the message line should be displayed
                on
Make_up:        Integer
Source:
Destination:
Used In:        disp_line
*******************************************************************

*******************************************************************
Name:      PROCESER.PAS
Type:      File
Description:  This procedure handles command decoding errors. It
              prompts the user for proper action to take for error
              correction.
Procedures Contained:  proces_error
Version:            1.1
Date:               16 Aug 83
Author:       Vincent M Parisi II, Capt, USAF
*******************************************************************

*******************************************************************
Name:      proces_error
Type:      Procedure
Description:  This procedure handles command decoding errors. It
              prompts the user for proper action to take for error
              correction.
Global Variables Used:     help_level,   cmdbuffer
Global Variables Changed:  None
Global Constants Used:     screen_width
Passed Variables:  error_code,     level,        cmdbuffer,
                   bufferpointer
Returned:          None
Files Read:        None
Files Written:     None
Aliases:           None
Procedures Called: gotoxy,     highlight,            nohighlight,
                   pause,      display_commandword, disp_msg,
                   clear_msg
Called By:         get_cmd

Version:           1.1
Date:              16 Aug 83
Author:      Vincent M Parisi II, Capt, USAF
Contained In File:   PROCESER.PAS
*******************************************************************

*******************************************************************
Name:     PROMPTCM.PAS
Type:     File
Description:  This file places the command line prompt at
              the row and column input.
Procedures Contained:    prompt_cmd
Version:           1.2
Date:              30 Oct 83
Author:      Vincent M Parisi II, Capt, USAF
*******************************************************************

*******************************************************************
Name:     prompt_cmd
Type:     Procedure
Description:  This procedure places the command line prompt at
              the row and column input.
Global Variables Used:     blanks
Global Variables Changed:  None
Global Constants Used:     as_assigned,        crt_only
Passed Variables:  row,     col
Returned:          None
Files Read:        None
Files Written:     None
Aliases:           None
Procedures Called: gotoxy,     highlight,            nohighlight,
                   out_string
Called By:         get_cmd

Version:           1.2
Date:              30 Oct 83
```

```
Author:       Vincent M Parisi II, Capt, USAF
Contained In File:   PROMPTCM.PAS
*******************************************************************

*******************************************************************
Name:              prompt_col_offset
Aliases:           None
Type Of Entry:  Constant
Description:    This is the offset from column one for the prompt.
Make_up:        Integer
Source:         prompt
Destination:
Used In:        prompt_help
*******************************************************************

*******************************************************************
Name:       PROMPTHE.PAS
Type:       File
Description:  This file displays the acceptable command words
              based on those already entered.
Procedure Contained:  prompt_help
Version:              2.2
Date:                 27 Sep 84
Author:       Vincent M Parisi II, Capt, USAF
*******************************************************************

*******************************************************************
Name:       prompt_help
Type:       Procedure
Description:  This procedure displays the scceptable command words
              based on those already entered.
Global Variables Used:     None
Global Variables Changed:  None
Global Constants Used:     crt_only,    endword,     doneword
Passed Variables:  row,      rec_num
Returned:          rec_num
Files Read:        None
Files Written:     None
Aliases:           None
Procedures Called: gotoxy,     get_line,     svideolow,
                   out_string, svideobold
Called By:         get_cmd

Version:           2.1
Date:              20 Oct 83
Author:       Vincent M Parisi II, Capt, USAF
Contained In File:   PROMPTHE.PAS
*******************************************************************
```

```
*******************************************************************
Name:           ptr_recs
Aliases:        None
Type Of Entry:  Global type definition
Description:    Type definition of an element within type dict_buffer
                It defines the structure that contains the pointers
                for the command syntax data structure.
Make_up:      ptr_rec = array[ 1..num_ptr_recs ] of integer
Source:       Declared in msdwtype
Destination:
Used In:      msdwtype
*******************************************************************

*******************************************************************
Name:       r
Aliases:    None
Type Of Entry: Variable
Description:   This is a variable for the IBM unique function stdout.
Make_up:       Integer
Source:
Destination:
Used In:       stdout
*******************************************************************

*******************************************************************
Name:           rad
Aliases:        None
Type Of Entry:  Variable
Description:    The radical of a term in roots.
Make_up:      Real
Source:
Destination:
Used In:      roots
*******************************************************************

*******************************************************************
Name:     readcom
Type:     Procedure
Description:  This procedure reads a command from the user and
              splits it into individual words in the command buffer.
Global Variables Used:     cmdbuffer,     macro_error,  blanks,
                           abort_command,  strng
Global Variables Changed:  cmdbuffer,  strng
Global Constants Used:     as_assigned,  buffersize,  wordsize,
                           terminal_only
Passed Variables:  cmdbuffer,      bufferpointer,    abort_command
Returned:          cmdbuffer,      bufferpointer
Files Read:        None
Files Written:     None
```

```
Aliases:            None
Procedures Called: get_strng,    ucase
Called By:          get_cmd

Version:            1.1
Date:               28 Oct 83
Author:       Vincent M Parisi II, Capt, USAF
Contained In File:   READCOM.PAS
*******************************************************************

*******************************************************************
Name:     READCOM.PAS
Type:     File
Description:  This file reads a command from the user and
              splits it into individual words in the command buffer.
Procedures Contained: readcom
Version:            1.1
Date:               28 Oct 83
Author:       Vincent M Parisi II, Capt, USAF
*******************************************************************

*******************************************************************
Name:      real_error
Aliases:   None
Type Of Entry: Global file variable
Description:
Make_up:
Source:         Declared in icecappc
Destination:
Used In:
*******************************************************************

*******************************************************************
Name:             real_root
Aliases:          None
Type Of Entry:    Variable
Description:      This variable is a temporary storage location for
                  the procedure roots.
Make-up:       Real
Source:
Destination:
Used In:       roots
*******************************************************************

*******************************************************************
Name:     REALS.PAS
Type:     File
Description:  This file contains the procedures to input and output
              real numbers.
```

```
Procedure Contained:  out_real,     get_real
Version:              2.4
Date:                 19 Aug 85
Author:         Vincent M Parisi II, Capt, USAF
Modified By:    Susan K. Mashiko, Capt, USAF
                Gary C. Tarczynski, Capt, USAF
*******************************************************************

*******************************************************************
Name:               rec_loc
Aliases:            None
Type Of Entry:      Variable
Description:        This variable is the integer value of the location
                    in a file.
Make-up:        Integer
Source:
Destination:
Used In:        get_location
*******************************************************************

*******************************************************************
Name:               rec_num
Aliases:            None
Type Of Entry:      Variable
Description:        Points to the record number of the syntax data
                    structure of interest.
Make-up:        Variable and data flow
Source:         get_line,     prompt_help,        disp_line,
                disp_msg,     get_cmd,            val_n_dec
Destination:
Used In:        get_lin,      prompt_help,        disp_line,
                disp_msg,     get_cmd,            val_n_dec
*******************************************************************

*******************************************************************
Name:   recover
Type:   Procedure
Description:  This procedure copies the user specified files into
              ICECAP 'tf&pols.dat' and the 'matrix.dat' files.
Global Variables Used:     abort_command
Global Variables Changed:  None
Global Constants Used:     as_assigned,      blanks,    crt_only,
Passed Variables:  None
Returned:          None
Files Read:        None
Files Written:     None
Aliases:           None
Procedures Called: clear,         gotoxy,         disp_msg,
                   get_strng,     pause,          clear_msg,
                    out_string
Called By:   select_routine

Version:     2.0
Date:        19 Sep 85
Author:      Susan K. Mashiko, Capt, USAF
             Gary C. Tarczynski, Capt, USAF
Contained In File:   UPDATE.PAS
*******************************************************************

*******************************************************************
Name:       recover_msg
Aliases:    None
Type Of Entry: Variable
Description:   This variable is the message number for help on the
               recover command.
Make_up:       Integer
Source:
Destination:
Used In:       help
*******************************************************************

*******************************************************************
Name:    RECOVER.PAS
Type:    File
Description:  This file copies the user specified files into
              ICECAP 'tf&pols.dat' and the 'matrix.dat' files.
Procedures Contained:  recover
Version:     2.0
Date:        19 Sep 85
Author:      Susan K. Mashiko, Capt, USAF
             Gary C. Tarczynski, Capt, USAF
*******************************************************************

*******************************************************************
Name:    rectangle
Type:    Procedure
Description:  This procedure draws a rectangle of given dimensions
              on the video screen.
Global Variables Used:     term
Global Variables Changed:  None
Global Constants Used:     term_length
Passed Variables:  line,  column,   width,   height
Returned:          None
Files Read:        None
Files Written:     None
Aliases:           None
Procedures Called: graphics,   gotoxy,    nographics
Called By:         title_slide
```

```
Version:              1.0
Date:                 27 Sep 84
Author:         Paul A Moore, Capt, USAF
Contained In File:    TERMINAL.PAS
*********************************************************************

*********************************************************************
Name:                remain_lines
Aliases:             None
Type Of Entry:       Variable
Description:         Counter of the total number of lines remaining in
                     the selected message.
Make-up:        Integer
Source:
Destination:
Used In:        disp_msg
*********************************************************************

*********************************************************************
Name:                repeat1
Aliases:             None
Type Of Entry:       Label
Description:         Used for goto statement.
Make-up:        Char
Source:
Destination:
Used In:        get_unfact,         get_fact,          recover,
                update
*********************************************************************

*********************************************************************
Name:                repeat2
Aliases:             None
Type Of Entry:       Label
Description:         Used for goto statement.
Make-up:        Char
Source:
Destination:
Used In:        recover,       update
*********************************************************************

*********************************************************************
Name:                repeatagain
Aliases:             None
Type Of Entry:       Label
Description:         Used for goto statement.
Make-up:        Char
Source:
Destination:
```

```
Used In:     form
*****************************************************************

*****************************************************************
Name:           resp
Aliases:        None
Type Of Entry:  Variable
Description:    The variable is the character response from the
                keyboard. Used when the system is put into a pause
                state.
Make-up:     Char
Source:
Destination:
Used In:     pause,     disp_msg
*****************************************************************

*****************************************************************
Name:           result
Aliases:        None
Type Of Entry:  Variable
Description:    The variable is used by the val conversion. Val
                converts a string to a number ( real or integer)
                result is the location of any invalid characters.
Make-up:     Integer
Source:
Destination:
Used In:     get_int,  get_real,   polymanip,  polymanip2,
             chgmat,   matrxmanip2
*****************************************************************

*****************************************************************
Name:   right_bracket
Type:   Procedure
Description: This procedure will draw the right bracket for a
             matrix.
Global Variables Used:     term
Global Variables Changed:  None
Global Constants Used:     None
Passed Variables:  num_rows,   num_cols
Returned:          None
Files Read:        None
Files Written:     None
Aliases:           None
Procedures Called: graphics,  gotoxy,  nographics
Called By:         make_pretty_large_matrix_two,
                   make_pretty_small_matrix

Version:           1.0
Date:              11 Sep 85
```

```
Author:       Susan K. Mashiko, Capt, USAF
              Gary C. Tarczynski, Capt, USAF
Contained In File:   GETMAT.PAS
*******************************************************************

*******************************************************************
Name:             root_num
Aliases:          None
Type Of Entry:    Variable
Description:      The variable the number of the root to be deleted
                  from the polynomial.
Make-up:      Integer
Source:
Destination:
Used In:      delroot,
*******************************************************************

*******************************************************************
Name:   roots
Type:   Procedure
Description:  This procedure uses the Bairstow's method of finding
              the roots of a polynomial.
Global Variables Used:     degree
Global Variables Changed:  degree
Global Constants Used:     maxdeg1
Passed Variables:  poly
Returned:          poly
Files Read:        None
Files Written:     None
Aliases:           None
Procedures Called: gotoxy,  highlight,  disp_msg,  nohighlight,
                   clear_msg,  pause
Called By:         poly,  polymlt,  polyadd,  spolymlt

Version:           2.0
Date:              6 Sep 85
Author:       Susan K. Mashiko, Capt, USAF
              Gary C. Tarczynski, Capt, USAF
Contained In File:   GETTF.PAS
*******************************************************************

*******************************************************************
Name:             row
Aliases:          None
Type Of Entry:    Variable
Description:      The variable is the row location on the screen.
Make-up:      Integer
Source:
Destination:
```

```
Used In:      prompt_cmd,    prompt_help,    get_r_num,
              get_fact,      get_unfact,     disp_matrx,
              get_poly_name, disppoly,       get_matrix_entries,
              disptf,        chgmat, make_pretty_small_matrix,
              make_pretty_large_matrix_one,   gotoxy
*****************************************************************

*****************************************************************
Name:           row_count
Aliases:        None
Type Of Entry:  Variable
Description:    The variable is a counter for the row location
                on the screen.
Make-up:      Integer
Source:
Destination:
Used In:      prompt_help
*****************************************************************

*****************************************************************
Name:           screen_width
Aliases:        None
Type Of Entry:  Global constant
Description:    This is the screen width in characters minus 1.
Make_up:      Integer
Source:       Declared in msdwcons
Destination:
Used In:      icecappc,        msdwtype,        pause,
              get_data,        proces_error,    make_pretty,
              gettf,           disp_line
*****************************************************************

*****************************************************************
Name:           second
Aliases:        None
Type Of Entry:  Variable
Description:    This variable if a matrix or a polynomial.
Make_up:        polynomial or matrix
Source:
Destination:
Used In:      mmatrix,   polymanip,   ppoly
*****************************************************************

*****************************************************************
Name:           selection
Aliases:        None
Type Of Entry:  Variable
Description:    This variable is used to indicate the option number
                selected by the user.
```

```
Make_up:        integer
Source:
Destination:
Used In:        form
******************************************************************

******************************************************************
Name:   SELECT.PAS
Type:   File
Description:  This file receives the name of the routine to
              call and calls it.
Procedures Contained:  select_routine
Version:             6.0
Date:                11 Oct 85
Author:          Susan K. Mashiko, Capt, USAF
                 Gary C. Tarczynski, Capt, USAF
                 Paul A. Moore, Capt, USAF
******************************************************************

******************************************************************
Name:   select_routine
Type:   Procedure
Description:  This procedure receives the name of the routine to
              call and calls it.
Global Variables Used:     cmdbuffer
Global Variables Changed:  None
Global Constants Used:     None
Passed Variables:  call_routine,  cmdbuffer,   number_of_commands
Returned:          None
Files Read:        None
Files Written:     None
Aliases:           None
Procedures Called: trim,   help,   define,    disp,
                   ccopyy, modify, recover,   update,
                   form,  frequency_response
Called By:         icecappc

Version:           6.0
Date:              11 Oct 85
Author:          Susan K. Mashiko, Capt, USAF
                 Gary C. Tarczynski, Capt, USAF
Contained In File:   SELECT.PAS
******************************************************************

******************************************************************
Name:     short_int
Aliases:   None
Type Of Entry: Global Variable
Description:   This variable is a defined as a integer.
```

```
Make_up:        Integer
Source:         Declared in concons
Destination:
Used In:        gettf,     make_pretty
*******************************************************************

*******************************************************************
Name:      show_abbreviation
Aliases:   None
Type Of Entry: Global variable
Description:    This variable is the flag that indicates whether
                the abbreviation of command words should be displayed.
Make_up:        Boolean
Source:         Declared in icecappc
Destination:
Used In:        icecappc,   get_data
*******************************************************************

*******************************************************************
Name:   smatrxmlt
Type:   Procedure
Description:  This procedure will multiply a matrix by a
              scalar.
Global Variables Used:     None
Global Variables Changed:  None
Global Constants Used:     None
Passed Variables:  amat,  bmat,   number
Returned:          bmat
Files Read:        None
Files Written:     None
Aliases:           None
Procedures Called: None
Called By:         matrx_manip2

Version:           1.0
Date:              20 Sep 85
Author:      Susan K. Mashiko, Capt, USAF
             Gary C. Tarczynski, Capt, USAF
Contained In File:   MATRXMAN.PAS
*******************************************************************

*******************************************************************
Name:      sorce_loc
Aliases:   None
Type Of Entry: Variable
Description:    This variable is integer value of the storage loca-
                tion of the source for a copy.
Make_up:        Integer
Source:
```

```
Destination:
Used In:       ccopyy,      move_tf,      move_poly,
               move_matrix
******************************************************************

******************************************************************
Name:     source
Aliases:  None
Type Of Entry: Variable
Description:   This variable is the name of the source for a copy.
Make_up:       cmdword
Source:
Destination:
Used In:       ccopyy
******************************************************************

******************************************************************
Name:   spolymlt
Type:   Procedure
Description:  This procedure will multiply a polynomial by a
              scalar.
Global Variables Used:     None
Global Variables Changed:  None
Global Constants Used:     None
Passed Variables:  apoly,  bpoly,   number
Returned:          apoly,  bpoly
Files Read:        None
Files Written:     None
Aliases:           None
Procedures Called: None
Called By:         polymanip2,   form

Version:           1.0
Date:              7 Oct 85
Author:          Susan K. Mashiko, Capt, USAF
                 Gary C. Tarczynski, Capt, USAF
Contained In File:   POLYMAN.PAS
******************************************************************

******************************************************************
Name:   standard_output
Type:   Procedure
Description:  This procedure will redirect the output from TURBO
              pascal to the operating system (MS-DOS). This allows
              the IBM PC to recognize escape codes.
Global Variables Used:     None
Global Variables Changed:  None
Global Constants Used:     None
Passed Variables:  c
```

```
Returned:           None
Files Read:         None
Files Written:      None
Aliases:            None
Procedures Called:  None
Called By:          any write or writeln statement. By setting
                    ConOutPtr:=Ofs(standard_ouput) in the program
                    icecappc, then the address of this procedure
                    is put into the pointer ConOutPtr. This pointer
                    is used by write and writeln statements to locate
                    code for output to the terminal.

Version:            1.0
Date:               3 Aug 85
Author:       Susan K. Mashiko, Capt, USAF
              Gary C. Tarczynski, Capt, USAF
Contained In File:   STDOUT.PAS
******************************************************************

******************************************************************
Name:      stat_line_width
Aliases:
Type Of Entry: Global constant
Description:   Width of the displayed status line
Make_up:  Integer (77)
Source:       Declared in icecappc
Destination: N/A
Used In:      icecappc,    clearscreen,     pause
******************************************************************

******************************************************************
Name:      stat_on
Aliases:   None
Type Of Entry: Global variable and data flow
Description:   This variable indicates whether the status line
               should be displayed on the CRT.
Make_up:       Boolean
Source:        Declared in icecappc
Destination:
Used In:       icecappc,     clear,     clearscreen,
               pause,        get_data
******************************************************************

******************************************************************
Name:      status_line
Aliases:   None
Type Of Entry: Global variable
Description:   This variable determines whether or no the status
               line will be displayed or not. Status line shows
```

```
                  the status of the printer, transaction, and temp
                  switches.
Make_up:          string[ stat_line_width ]
Source:           Declared in Icecappc
Destination:
Used In:          clear,        clearscreen,        pause,
                  bld_stat_line, get_data
******************************************************************

******************************************************************
Name:    STDOUT.PAS
Type:    File
Description:  This file will redirect the output from TURBO
              pascal to the operating system (MS-DOS). This allows
              the IBM PC to recognize escape codes.
Procedures Contained: standard_output
Version:               1.0
Date:                  3 Aug 85
Author:          Susan K. Mashiko, Capt, USAF
                 Gary C. Tarczynski, Capt, USAF
******************************************************************

******************************************************************
Name:             step
Aliases:          None
Type Of Entry:    Variable
Description:      This is a counter.
Make_up:          Integer
Source:
Destination:
Used In:       matrxinv
******************************************************************

******************************************************************
Name:             stepper
Aliases:          None
Type Of Entry:    Variable
Description:      This is a counter.
Make_up:          Integer
Source:
Destination:
Used In:       matrxinv
******************************************************************

******************************************************************
Name:        stop_msg
Aliases:     None
Type Of Entry: Variable
Description:   This variable is the message number for help on the
```

```
                  stop command.
Make_up:          Integer
Source:
Destination:
Used In:          help
*******************************************************************

*******************************************************************
Name:       store
Aliases:    None
Type Of Entry: Variable
Description:      This variable is a temporary storage location for
                  the procedure roots.
Make_up:          Real
Source:
Destination:
Used In:          roots
*******************************************************************

*******************************************************************
Name:       stor_loc
Aliases:    None
Type Of Entry: Variable
Description:      This variable is a storage location in the files
                  'tf&pols.dat' and 'matrix.dat'.
Make_up:          Integer
Source:
Destination:
Used In:          gettf,    matrxmanip1,   matrxmanip2,
                  get_poly, getmat,        inroot,
                  delroot,  disppoly,      disp_matrx,
                  disptf,   chgmat,        poly_into_storage,
                  polymanip, polymanip2,   poly_from_storage
*******************************************************************

*******************************************************************
Name:       strng
Aliases:    None
Type Of Entry: Global variable and data flow
Description:      This is a general purpose string buffer.
Make_up:          String
Source:           Declared in icecappc
Destination:
Used In:          getchi,         ck_chr,          get_int,
                  get_strng       get_real
*******************************************************************

*******************************************************************
Name:       sum
```

```
Aliases:   None
Type Of Entry: Variable
Description:   This variable is a temporary storage location for
               the procedure roots.
Make_up:       Real
Source:
Destination:
Used In:       roots
*******************************************************************

*******************************************************************
Name:   svideobold
Type:   Procedure
Description:  This procedure inserts the char string to put the
              screen into bold video.
Global Variables Used:     term
Global Variables Changed:  None
Global Constants Used:     term_length
Passed Variables:  instring,  pos
Returned:          pos
Files Read:        None
Files Written:     None
Aliases:           None
Procedures Called: None
Called By:         prompt_help

Version:           1.0
Date:              27 Sep 84
Author:      Paul A Moore, Capt, USAF
Contained In File:   TERMINAL.PAS
*******************************************************************

*******************************************************************
Name:   svideolow
Type:   Procedure
Description:  This procedure inserts the char string to put the
              screen into low video.
Global Variables Used:     term
Global Variables Changed:  None
Global Constants Used:     term_length
Passed Variables:  instring,  pos
Returned:          pos
Files Read:        None
Files Written:     None
Aliases:           None
Procedures Called: None
Called By:         prompt_help

Version:           1.0
```

```
Date:                   27 Sep 84
Author:          Paul A Moore, Capt, USAF
Contained In File:   TERMINAL.PAS
*******************************************************************

*******************************************************************
Name:        switch
Aliases:     None
Type Of Entry: Variable
Description:    This variable is the flag that indicates whether
                the selected terminal type is either the H19 or a
                VT100.
Make_up:        Boolean
Source:
Destination:
Used In:        ttype
*******************************************************************

*******************************************************************
Name:        swit_msg
Aliases:     None
Type Of Entry: Variable
Description:    This variable is the message number for help on the
                switch command.
Make_up:        Integer
Source:
Destination:
Used In:        help
*******************************************************************

*******************************************************************
Name:        system_msg
Aliases:     None
Type Of Entry: Variable
Description:    This variable is the message number for help on the
                program ICECAP-PC.
Make_up:        Integer
Source:
Destination:
Used In:        help
*******************************************************************

*******************************************************************
Name:        temp
Aliases:     None
Type Of Entry: Global variable
Description:    This variable is the flag that indicates whether
                the current transactions should be saved in a temp-
                orary file.
```

```
Make_up:        Boolean
Source:         Declared in icecappc
Destination:
Used In:        icecappc,     out_string,   bld_stat_line,
                out_int,      get_data,     out_real
*******************************************************************

*******************************************************************
Name:            temp
Aliases:         None
Type Of Entry:   Variable
Description:     This is a temporary storage area.
Make_up:       Real
Source:
Destination:
Used In:       matrxinv
*******************************************************************

*******************************************************************
Name:            temp2
Aliases:         None
Type Of Entry:   Variable
Description:     This is a temporary storage area.
Make_up:       Real
Source:
Destination:
Used In:       matrxinv
*******************************************************************

*******************************************************************
Name:        temp_file
Aliases:     None
Type Of Entry: Global file variable
Description:    This file temporarily captures the user's instruc-
                tions. This will allow the user to print out results
                after he/she has verified the results on the screen
Make_up:        Text
Source:         Declared in icecappc
Destination:
Used In:        out_string,   out_int
*******************************************************************

*******************************************************************
Name:        TEMP.OUT
Type:        File
Description:  This file contains the user / SW transaction
              history (only the most recent).
Used In:     get_data
*******************************************************************
```

```
*******************************************************************
Name:           temppol
Aliases:        None
Type Of Entry:  Variable
Description:    This is a temporary storage area for a polynomial.
Make_up:     polynomial
Source:
Destination:
Used In:     form
*******************************************************************

*******************************************************************
Name:      tempstr
Aliases:   None
Type Of Entry: Variable
Description:   This variable is a string used for temporary storage.
Make_up:       String[ 10 ]
Source:        svideolow,    svideobold
Destination:
Used In:       svideolow,    svideobold
*******************************************************************

*******************************************************************
Name:      term
Aliases:   None
Type Of Entry: Global file variable and data flow
Description:   This is an array that contains the terminal control
               codes. Additionally, it is an element of record type
               DATA.
Make_up:       term_array
Source:        Declared in icecappc
Destination:
Used In:       icecappc,       rectangle,      videobold,
               svideobold,     svideolow,      videolow,
               clearscreen,    clear,          gotoxy,
               nohighlight,    highlight,      nographics,
               graphics,       left_bracket,   right_bracket
*******************************************************************

*******************************************************************
Name:       term_array
Aliases:    None
Type Of Entry:  Global type definition
Description:    Defines the type for the TERM data flow.
Make_up:        array[ 1..term_length ] of byte
Source:         Declared in icecappc
Destination:    N/A
Used In:        icecappc,    get_data
*******************************************************************
```

```
******************************************************************
Name:        term_dat
Aliases:     None
Type Of Entry:  Variable
Description:    Is defined as term_array.
Make_up:        term_array
Source:         title_slide,    get_data
Destination:    N/A
Used In:        title_slide,    get_data
******************************************************************

******************************************************************
Name:    TERMINAL.PAS
Type:    File
Description:  This file contains the procedures that interface
              with the terminal.
Procedures Contained:   graphics,      nographics,      highlight,
                        nohighlight,   gotoxy,          clear,
                        clearscreen,   videolow,        svideolow,
                        videobold,     svideobold,      rectangle
Version:     3.0
Date:        12 Dec 84
Author:      Paul A Moore, Capt, USAF
******************************************************************

******************************************************************
Name:       terminal_only
Aliases:    None
Type Of Entry:  Global constant and data flow
Description:    Flag that indicates to get_string that input should
                come only from the terminal.
Make_up:       Char
Source:        Declared in icecappc
Destination:
Used In:
******************************************************************

******************************************************************
Name:           term_length
Aliases:        None
Type Of Entry:  Global constant
Description:    This is the length of the terminal data array.
Make_up:     Integer
Source:      Declared in msdwcons
Destination:
Used In:     icecappc,    msdwtype,     graphics,
             nographics,  highlight,    nohighlight,
             gotoxy,      clear,        clearscreen,
             videolow,    svideolow,    videobold,
          svideobold,  get_data
******************************************************************

******************************************************************
Name:           tf_file
Aliases:        None
Type Of Entry:  Variable
Description:    This is a file of polynomial.
Make_up:     File of polynomial
Source:
Destination:
Used In:     move_tf
******************************************************************

******************************************************************
Name:           third
Aliases:        None
Type Of Entry:  Variable
Description:    This is either a polynomial or a matrix.
Make_up:     polynomial or matrix
Source:
Destination:
Used In:     ppoly,   mmatrix
******************************************************************

******************************************************************
Name:   title_slide
Type:   Procedure
Description:  This procedure displays the system title slide. It
              demonstrates that at a minimum the terminal control
              codes have been initialized properly.
Global Variables Used:     None
Global Variables Changed:  None
Global Constants Used:     None
Passed Variables:  term_dat
Returned:          None
Files Read:        None
Files Written:     None
Aliases:           None
Procedures Called: clear,       gotoxy,         highlight,
                   nohighlight, rectangle
Called By:         get_data
Version:      3.0
Date:         22 Jul 85
Author:       Susan K. Mashiko, Capt, USAF
              Gary C. Tarczynski, Capt, USAF
Contained In File:   GETDAT.PAS
******************************************************************
```

```
*******************************************************************
Name:       trans
Aliases:    None
Type Of Entry: Global variable
Description:   This variable is the flag that indicates whether
               the transaction file is on. i.e. should all
               transactions be saved in a file.
Make_up:       Boolean
Source:        Declared in icecappc
Destination:
Used In:       icecappc,      out_string,    bld_stat_line,
               out_int,       get_data,      out_real
*******************************************************************

*******************************************************************
Name:       TRANSACT.ION
Type:       File
Description:  This file contains the user / SW transaction
              history.
Used In:    get_data
*******************************************************************

*******************************************************************
Name:       trans_file
Aliases:    None
Type Of Entry: Global file variable
Description:   This file contains the user / SW transaction history.
               It may be turned on and off by the user with trans.
Make_up:       Text
Source:        Declared in icecappc
Destination:
Used In:       out_string,    out_int
*******************************************************************

*******************************************************************
Name:              trans_file_name
Aliases:           None
Type Of Entry:     Global variable
Description:       The name of the file that contains the user / SW
                   transaction history. It is turned on and off by the
                   user.
Make_up:       Paramstring
Source:        Declared in ICECAPP
Destination:
Used In:       icecappc,    get_data
*******************************************************************

*******************************************************************
Name:    trim
```

Type: Procedure
Description: This procedure removes any trailing characters from a cmdword.
Global Variables Used: None
Global Variables Changed: None
Global Constants Used: wordsize
Passed Variables: cmdword
Returned: cmdword
Files Read: None
Files Written: None
Aliases: None
Procedures Called: None
Called By: displa_commandword, readcom, val_n_dec, ccopyy, help, gettf, get_poly, matrxmanip1, matrxmanip2, define, disp_matrx, ppoly, chgmat, inroot, delroot, polymanip, polymanip2, get_poly_name, disppoly, select_routine, modify, disp, disptf, poly_into_storage, poly_from_storage, check_word, get_poly

Version: 1.1
Date: 30 Jun 84
Author: Paul A Moore, Capt, USAF
Contained In File: TRIM.PAS
****

****
Name: TRIM.PAS
Type: File
Description: This file removes any trailing characters from a cmdword.
Procedures Contained: trim
Version: 1.1
Date: 30 Jun 84
Author: Paul A Moore, Capt, USAF
****

****
Name: ttype
Type: Procedure
Description: This procedure acts as a switch between two different terminal types
Global Variables Used: None
Global Variables Changed: None
Global Constants Used: None
Passed Variables: switch, wchar
Returned: None

```
Files Read:         None
Files Written:      None
Aliases:            None
Procedures Called: None
Called By:          gotoxy

Version:            2.0
Date:               21 Oct 84
Author:      Paul A Moore, Capt, USAF
Contained In File:    TERMINAL.PAS
*******************************************************************

*******************************************************************
Name:             tword
Aliases:          None
Type Of Entry:  Variable
Description:      This variable is used a temporary storage location
                  for the command word while separating the individual
                  command words.
Make_up:     msg_line
Source:
Destination:
Used In:     readcom
*******************************************************************

*******************************************************************
Name:       type_move
Aliases:    None
Type Of Entry: Variable
Description:    This variable is used as a flag to determine the
                type to move that will be made:  tf, poly, matrix.
Make_up:      Char
Source:
Destination:
Used In:     get_location,    ccopyy
*******************************************************************

*******************************************************************
Name:       u
Aliases:    None
Type Of Entry: Variable
Description:   Used as a temporary storage location in roots.
Make_up:      Real
Source:
Destination:
Used In:     roots
*******************************************************************

*******************************************************************
```

```
Name:   UCASE.PAS
Type:   File
Description:  This file contains the procedure to convert a lower
              case string to upper case.
Procedures Contained: ucase
Version:      1.1
Date:         28 Aug 83
Author:       Vincent M. Parisi II, Capt, USAF
******************************************************************

******************************************************************
Name:   ucase
Type:   Procedure
Description:  This procedure converts a lower case string to an
              upper case string.
Global Variables Used:     None
Global Variables Changed:  None
Global Constants Used:     None
Passed Variables:  instring
Returned:          instring
Files Read:        None
Files Written:     None
Aliases:           None
Procedures Called: None
Called By:    readcom,   chgmat,   get_poly_name,   get_matrx_name

Version:      1.1
Date:         28 Aug 83
Author:       Vincent M. Parisi II, Capt, USAF
Contained In File:   UCASE.PAS
******************************************************************

******************************************************************
Name:      ui
Aliases:   None
Type Of Entry: Variable
Description:   Used as a temporary storage location in roots.
Make_up:      Real
Source:
Destination:
Used In:      roots
******************************************************************

******************************************************************
Name:   update
Type:   Procedure
Description:  This procedure copyies the ICECAP 'tf&pols.dat' and
              the 'matrix.dat' files into a user specified file.
Global Variables Used:     abort_command
Global Variables Changed:  None
Global Constants Used:     as_assigned,      blanks,    crt_only,
Passed Variables:  None
Returned:          None
Files Read:        TF&POLS.DAT,   MATRIX.DAT
Files Written:     user specified file name
Aliases:           None
Procedures Called: clear,          gotoxy,         disp_msg,
                   get_strng,     pause,          clear_msg,
                   out_string
Called By:   select_routine

Version:     2.0
Date:        19 Sep 85
Author:      Susan K. Mashiko, Capt, USAF
             Gary C. Tarczynski, Capt, USAF
Contained In File:   UPDATE.PAS
*******************************************************************

*******************************************************************
Name:      update_msg
Aliases:   None
Type Of Entry: Variable
Description:   This variable is the number of the help message for
               the update command.
Make_up:     Integer
Source:
Destination:
Used In:     help
*******************************************************************

*******************************************************************
Name:   UPDATE.PAS
Type:   File
Description:  This file copies the ICECAP 'tf&pols.dat' and
              the 'matrix.dat' files into a user specified file.
Procedures Contained:  update
Version:     2.0
Date:        19 Sep 85
Author:      Susan K. Mashiko, Capt, USAF
             Gary C. Tarczynski, Capt, USAF
*******************************************************************

*******************************************************************
Name:      v
Aliases:   None
Type Of Entry: Variable
Description:   Used as a temporary storage location in roots.
Make_up:     Real
```

```
Source:
Destination:
Used In:     roots
*******************************************************************

*******************************************************************
Name:   val_n_dec
Type:   Procedure
Description:  This procedure validates and decodes the command
              line input by the user. The process begins by
              recovering record 1 from the syntax table, using
              getline. Compares to first word in the command buffer
              If there is no error the process repeats itself
              until there is a valid command. If there are any
              anomolies a flag is set and a error message displayed
              to the user.
Global Variables Used:     cmdbuffer,   call_routine
Global Variables Changed:  cmdbuffer,   call_routine
Global Constants Used:     DONEWORD,  ENDCODE
Passed Variables: level,              rec_num,      error_code,
                  num_of_commands,  cmdbuffer,    call_routine
Returned:         level,  rec_num,   error_code,  num_of_commands
                  cmdbuffer,          call_routine
Files Read:       None
Files Written:    None
Aliases:          None
Procedures Called: check_word,      get_line,     trim
Called By:   get_cmd

Version:     1.6
Date:        16 Aug 83
Author:      Vincent M Parisi II, Capt, USAF
Contained In File:   VALNDEC.PAS
*******************************************************************

*******************************************************************
Name:   VALNDEC.PAS
Type:   File
Description:  This file validates and decodes the command
              line input by the user. The process begins by
              recovering record 1 from the syntax table, using
              getline. Compares to first word in the command buffer
              If there is no error the process repeats itself
              until there is a valid command. If there are any
              anomolies a flag is set and a error message displayed
              to the user.
Procedures Contained: check_word,      val_n_dec
Version:     1.7
Date:        29 Aug 83
```

```
Author:      Vincent M Parisi II, Capt, USAF
*******************************************************************

*******************************************************************
Name:      vi
Aliases:   None
Type Of Entry: Variable
Description:   Used as a temporary storage location in roots.
Make_up:     Real
Source:
Destination:
Used In:     roots
*******************************************************************

*******************************************************************
Name:   videobold
Type:   Procedure
Description:  This procedure writes the char string to put the
              screen into bold video.
Global Variables Used:     term
Global Variables Changed:  None
Global Constants Used:     term_length
Passed Variables:  None
Returned:          None
Files Read:        None
Files Written:     None
Aliases:           None
Procedures Called: None
Called By:

Version:     1.0
Date:        27 Sep 84
Author:      Paul A. Moore, Capt, USAF
Contained In File:   TERMINAL.PAS
*******************************************************************

*******************************************************************
Name:   videolow
Type:   Procedure
Description:  This procedure writes the char string to put the
              screen into low video.
Global Variables Used:     term
Global Variables Changed:  None
Global Constants Used:     term_length
Passed Variables:  None
Returned:          None
Files Read:        None
Files Written:     None
Aliases:           None
```

```
Procedures Called: None
Called By:

Version:      1.0
Date:         27 Sep 84
Author:       Paul A. Moore, Capt, USAF
Contained In File:   TERMINAL.PAS
******************************************************************

******************************************************************
Name:        w
Aliases:     None
Type Of Entry: Variable
Description:   Generally used as a counter.
Make_up:      Integer
Source:
Destination:
Used In:      roots
******************************************************************

******************************************************************
Name:           wchar
Aliases:        None
Type Of Entry:  Variable
Description:    This is used as a switch between terminal types.
Make_up:      Integer
Source:
Destination:
Used In:      ttype
******************************************************************

******************************************************************
Name:           width
Aliases:        None
Type Of Entry:  Variable
Description:    This is the width of the triangle in columns.
Make_up:      Integer
Source:
Destination:
Used In:      rectangle
******************************************************************

******************************************************************
Name:           wordlength
Aliases:        None
Type Of Entry:  Global constant
Description:    This is the length of word in storage.
Make_up:      Integer (9)
Source:       Declared in msdwcons
```

```
Destination:
Used In:     msdwtype,     get_line
*******************************************************************

*******************************************************************
Name:      word_num
Aliases:   None
Type Of Entry: Variable
Description:   Pointer to the word in the command buffer that is
               to be displayed on the crt.
Make_up:     Integer
Source:      get_cmd,    proces_error
Destination:
Used In:     displya_commandword
*******************************************************************

*******************************************************************
Name:      wordnumber
Aliases:   None
Type Of Entry: Variable
Description:   This is the number of words in the command buffer.
Make_up:     Integer
Source:
Destination:
Used In:     help,   define,   disp,    mmatrix,   modify,
             ppoly,  inroot,   delroot,  get_poly_name
*******************************************************************

*******************************************************************
Name:     wordsize
Aliases:  None
Type Of Entry: Global constant
Description:   Size of string for internal command words
Make_up:       Integer (12)
Source:        Declared in ICECAPP
Destination:   N/A
Used In:       icecappc,       get_line,        trim,
               val_n_dec,      displa_command,  help,
               select
*******************************************************************

*******************************************************************
Name:            wordtype
Aliases:         None
Type Of Entry:   Global type definition
Description:     Type definition of a string of length wordlength.
Make_up:     wordtype = string[ wordlength ]
Source:      Declared in msdwtype
Destination:
```

```
Used In:
********************************************************************

********************************************************************
Name:      yes
Aliases:   None
Type Of Entry: Global constant
Description:   Boolean variable
Make_up:     Boolean
Source:      Declared in ICECAPP
Destination: N/A
Used In:
********************************************************************

********************************************************************
Name:      your_name
Aliases:   None
Type Of Entry: Variable
Description:   This is the user defined name for the disk files for
               the storage of 'tf&pols.dat' and matrix.dat'.
Make_up:     msg_line
Source:
Destination:
Used In:     recover,    update
********************************************************************

********************************************************************
Name:      z
Aliases:   None
Type Of Entry: Variable
Description:   Generally used as a counter.
Make_up:     Integer
Source:
Destination:
Used In:     roots
********************************************************************
```

Appendix E: System Software

Introduction

This file contains a cross index listing for procedures and source files. The source files are indicated by capital or upper case letters while the functions and procedures are indicated by the lower case letters.

BUILDDAT

This is the cross index for the menu installation program BUILDDAT. These files were not changed during this thesis effort, as a result, the code for the following BUILDDAT files is not included here. The code may be found in reference 15 and again in reference 12, Capt Parisi's MS Thesis and Capt Moore's MS Thesis respectively.

```
BUILDDAT.PAS
          make_param
          make_terminal
          make_printer
          make_help
          builddat

ADDKEY.PAS
          addkeywordtomenu

ADDTOMEN.PAS
          addtomenu

ADDWORD.PAS
          addword

AVL-1.PAS
          create
          isempty
          lchild
          rchild
          dataval

AVL-2.PAS
          makebt
          LNR
          displaytree
          printtree
          treedispose
```

```
AVL-3.PAS
          leftbalance
          rightbalance

AVL-4.PAS
          avlinsert
          btlocate

DEFCALL.PAS
          findcall
          addcall
          define_call_routine

DEFMENU.PAS
          define_menu

DISPROC.PAS
          callsdispose

ERRORMSG.PAS
          errormsg

GETWORD.PAS
          get_word

LOCMENU.PAS
          copymenuword
          locate_menu_node

MAKEMENU.PAS
          init_menu
          make_menu

MAKEPROC.PAS
          calc_min_chars
          make_word_list
          number_calls
          make_call_records
          make_keyw_records
          make_decoding_paths

MENUCONS.PAS - Menu Constant Definition File

MENUPRNT.PAS
          menu_print

MENUTYPE.PAS - Menu Type Definition File

MSDWCONS.PAS - MICROSDW.SYS Constant Def. File
```

```
MSDWTYPE.PAS - MICROSDW.SYS Type Def. File

READMENU.PAS
          readmenu
```

ICECAP-PC

This list includes the modified user interface, MICROSDW files (12), as well as the ICECAP-PC files created as part of this thesis effort. The identification codes are as follows:

- The ICECAP-PC files are preceeded by two asterisks (**).
- Any files that require different versions for the IBM-PC/AT/XT and the Z-100 is annotated with, Z-100 and IBM versions.
- Any file that is for the IBM-PC/AT/XT only is annotated with, IBM Unique.
- Any file that has different versions for a hard drive and a floppy system is annotated with, Hard and Floppy.

The files are presented in the order of this cross index.

```
** BODE.PAS
                frequency_response

** CONCONS.PAS - ICECAP-PC Constant Definition File

** COPY.PAS
                get_location
                move_tf
                move_poly
                move_matrix
                ccopyy

** DEFINE.PAS
                get_poly
                define

** DELROOT.PAS
                delroot

** DISP.PAS
                disptf
                disp

   DISPLAYC.PAS
                displa_commandword
```

```
** FORM.PAS
                poly_from_storage
                poly_into_storage
                form

   GETCOM.PAS
                get_cmd

** GETDAT.PAS  ( Z-100 and IBM versions )
                title_slide
                bld_stat_line
                get_data

   GETINT.PAS
                getchi
                del_lst_ch
                ck_chr
                out_int
                get_int

   GETLINE.PAS
                get_line

** GETMAT.PAS
                left_bracket
                right_bracket
                make_pretty_large_matrix_one
                make_pretty_large_matrix_two
                get_matrix_entries
                make_pretty_small_matrix
                getmat

   GETSTRIN.PAS
                get_strng

** GETTF.PAS
                get_r_num
                make_pretty
                get_fact
                form_poly
                get_unfact
                roots
                poly
                gettf

** HELP.PAS
                help
```

```
** ICECAPPC.PAS   ( Z-100 and IBM-unique versions )
                  ( Hard and Floppy )
              icecappc

** INROOT.PAS
              inroot

   INSTRUCT.PAS
              instruction

** MATRIX.PAS
              disp_matrx
              matrx_manip1
              matrx_manip2
              get_matrx_name
              mmatrix

** MATRXMAN.PAS
              matrxadd
              matrxsub
              mmatrxmlt
              smatrxmlt
              matrxtran
              matrxinv

** MODIFY.PAS
              chgmat
              modify

   MSDWCONS.PAS - MICROSDW.SYS Constant Def. File

   MSDWTYPE.PAS - MICROSDW.SYS Type Def. File

   MSG.PAS
              disp_line
              clear_msg
              disp_msg

   OUTPUT.PAS
              out_string

   PAUSE.PAS
              pause
```

```
** POLYMAN.PAS
             polyadd
             polysub
             polymlt
             spolymlt

** POLY.PAS
             disppoly
             polmanip
             polmanip2
             get_poly_name
             ppoly

   PROCESER.PAS
             proces_error

   PROMPTCM.PAS
             prompt_cmd

   PROMPTHE.PAS
             prompt_help

   READCOM.PAS
             readcom

** REALS.PAS
             out_real
             get_real

** RECOVER.PAS
             recover

** SELECT.PAS
             select_routine

** STDOUT.PAS ( IBM Unique )
             standard_output

   TERMINAL.PAS
             graphics
             nographics
             highlight
             nohighlight
             gotoxy
             clear
             ClearScreen
             VideoLow
             SVideoLow
             VideoBold
```

```
              SVideoBold
              Rectangle

    TRIM.PAS
              trim

    UCASE.PAS
              ucase

 ** UPDATE.PAS
              update

    VALNDEC.PAS
              check_word
              val_n_dec
```

```
(****************************************************************************
*****************************************************************************
**                                                                         **
**      file:            BODE.PAS                                          **
**      procedures contained:  frequency_response                         **
**      version:         TEST                                              **
**      date:            27 September 1985                                 **
**      description:     This file contains all the procedures for        **
**                       frequency response calculations.                 **
**      author:          Gary C. Tarczynski, Capt, USAF                    **
**                       Susan K. Mashiko, Capt, USAF                      **
**                                                                         **
*****************************************************************************
****************************************************************************)

(****************************************************************************
*                                                                           *
*       procedure:       frequency_response                                 *
*       version:         TEST                                               *
*       date:            27 September 1985                                  *
*       description:     This procedure acts as the executive for           *
*                        frequency response calculations   First,           *
*                        it prompts the user to choose units for            *
*                        frequency, magnitude, and phase angle.             *
*                        Then, it calls the appropriate functions           *
*                        and subroutines to perform the calculations.       *
*                        Finally, it displays the data in a tabular         *
*                        format.                                            *
*       global variables used:                                              *
*       global variables changed:                                           *
*       global constants used:                                              *
*       passed variables:                                                   *
*       returned variables:                                                 *
*       files created:                                                      *
*       files read:                                                         *
*       files written:                                                      *
*       procedures called:                                                  *
*       called by:                     select_routine                       *
*       author:          Gary C. Tarczynski, Capt, USAF                     *
*                        Susan K. Mashiko, Capt, USAF                       *
*                                                                           *
****************************************************************************)

procedure frequency_response;

var
  i          :     integer;

begin

  ClearScreen;


FILE:  BODE.PAS
```

```
  gotoxy( 5, 0 ).
  out_string( 'FREQUENCY RESPONSE', crt_only );
  gotoxy( 7, 0 );
  out_string( 'is not implemented yet.', crt_only );
  pause;
  ClearScreen;
  exit;

end;
```

FILE: BODE.PAS

```
(**********************************************************************
***********************************************************************
**                                                                   **
**      file:         CONCONS.PAS                                    **
**      version:      1.0                                            **
**      date:         26 August 85                                   **
**      description:  Contains the constants, type, and var          **
**                    declarations for the controls procedures       **
**                    and functions.                                 **
**      author:       Susan K. Mashiko, Capt, USAF                   **
**                    Gary C. Tarczynski, Capt, USAF                 **
**                                                                   **
***********************************************************************
**********************************************************************)

const
   max_deg  = 10;
   maxdeg1  = 11;
   max_rows = 10;
   max_cols = 10;
   pi       = 3.1415926536;

type
   short_int = integer;

   complex  = record
     realpart : real;
     imagpart : real;
     end;

   polynomial = record
     change      : boolean;
     coefficient : real;
     polydeg     : integer;
     polyfact    : array[ 1..max_deg ] of complex;
     polypoly    : array[ 1..maxdeg1 ] of real;
     end;

   matrix = record
     num_rows : integer;
     num_cols : integer;
     element  : array[ 1..max_rows,1..max_cols]of real;
     end;

var
   degree  : integer;
   degree1 : integer;



FILE: CONCONS.PAS
```

```
(*****************************************************************
******************************************************************
**                                                              **
**      file:           COPY.PAS                                **
**      procedures contained:  get_location, move_tf, move_poly, **
**                             move_matrix, ccopyy              **
**      version:        3.0                                     **
**      date:           22 September 1985                       **
**      description:    This file contains the procedures that  **
**                      will copy data from one transfer function **
**                      to another, from one polynomial to      **
**                      another, or from one matrix to another. **
**      author:         vincent m. parisi ii, capt, usaf        **
**                      Gary C. Tarczynski, Capt, USAF          **
**                      Susan K. Mashiko, Capt, USAF            **
**                                                              **
******************************************************************
*****************************************************************)

(*****************************************************************
*                                                               *
*       procedure:      get_location                            *
*       version:        2.0                                     *
*       date:           04 September 1985                       *
*       description:    This procedure determines the record    *
*                       location of the source and destination  *
*                       objects for a copy function.            *
*       passed variables:  location, rec_loc, type_move         *
*       returned variables:  rec_loc, type_move                 *
*       called by:      ccopyy                                  *
*       author:         vincent m. parisi ii, capt, usaf        *
*       modified by:    Gary C. Tarczynski, Capt, USAF          *
*                       Susan K. Mashiko, Capt, USAF            *
*       mod description:  The entire procedure was modified to  *
*                       customize it for ICECAP.                *
*       mod date:       04 September 1985                       *
*                                                               *
*****************************************************************)

overlay procedure get_location( location:cmdword; var rec_loc:integer;
                                var type_move:char);

begin

  if location = 'OLTF' then
    begin
      rec_loc := 0;
      type_move := 'T';
    end;


FILE: COPY.PAS
```

```
if location = 'CLTF' then
  begin
    rec_loc := 2;
    type_move := 'T';
  end;

if location = 'GTF' then
  begin
    rec_loc := 4;
    type_move := 'T';
  end;

if location = 'HTF' then
  begin
    rec_loc := 6;
    type_move := 'T';
  end;

if location = 'TF1' then
  begin
    rec_loc := 8;
    type_move := 'T';
  end;

if location = 'TF2' then
  begin
    rec_loc := 10;
    type_move := 'T';
  end;

if location = 'TF3' then
  begin
    rec_loc := 12;
    type_move := 'T';
  end;

if location = 'TF4' then
  begin
    rec_loc := 14;
    type_move := 'T';
  end;

if location = 'TF5' then
  begin
    rec_loc := 16;
    type_move := 'T';
  end;

if location = 'ONPOLY' then
```

FILE: COPY.PAS

```
    begin
      rec_loc := 0;
      type_move := 'P';
    end;

  if location = 'ODPOLY' then
    begin
      rec_loc := 1;
      type_move := 'P';
    end;

  if location = 'CNPOLY' then
    begin
      rec_loc := 2;
      type_move := 'P';
    end;

  if location = 'CDPOLY' then
    begin
      rec_loc := 3;
      type_move := 'P';
    end;

  if location = 'GNPOLY' then
    begin
      rec_loc := 4;
      type_move := 'P';
    end;

  if location = 'GDPOLY' then
    begin
      rec_loc := 5;
      type_move := 'P';
    end;

  if location = 'HNPOLY' then
    begin
      rec_loc := 6;
      type_move := 'P';
    end;

  if location = 'HDPOLY' then
    begin
      rec_loc := 7;
      type_move := 'P';
    end;

  if location = 'POLYA'  hen
    begin
```

FILE: COPY.PAS

```
      rec_loc := 18;
      type_move := 'P';
    end;

  if location = 'POLYB' then
    begin
      rec_loc := 19;
      type_move := 'P';
    end;

  if location = 'POLYC' then
    begin
      rec_loc := 20;
      type_move := 'P';
    end;

  if location = 'POLYD' then
    begin
      rec_loc := 21;
      type_move := 'P';
    end;

  if location = 'POLYE' then
    begin
      rec_loc := 22;
      type_move := 'P';
    end;

  if location = 'MATA' then
    begin
      rec_loc := 0;
      type_move := 'M';
    end;

  if location = 'MATB' then
    begin
      rec_loc := 1;
      type_move := 'M';
    end;

  if location = 'MATC' then
    begin
      rec_loc := 2;
      type_move := 'M';
    end;

  if location = 'MATD' then
    begin
      rec_loc := 3;
```

FILE: COPY.PAS

```
      type_move := 'M';
    end;

  if location = 'MATE' then
    begin
      rec_loc := 4;
      type_move := 'M';
    end;

end;

(*******************************************************************
*                                                                  *
*       procedure:      move_tf                                    *
*       version:        2.0                                        *
*       date:           04 September 1985                          *
*       description:    This procedure receives the source and     *
*                       destination transfer function locations,   *
*                       reads the source and moves it to the       *
*                       destination.                               *
*       passed variables:       sorce_loc, dest_loc                *
*       files read:             TF&POLS.DAT                        *
*       files written:          TF&POLS.DAT                        *
*       called by:              ccopyy                             *
*       author:         vincent m. parisi ii, capt, usaf           *
*       modified by:    Gary C. Tarczynski, Capt, USAF             *
*                       Susan K. Mashiko, Capt, USAF               *
*       mod description:  Converted from Pascal MT+ to TURBO       *
*                       Pascal.                                    *
*       mod date:       04 September 1985                          *
*                                                                  *
*******************************************************************)

overlay procedure move_tf( sorce_loc:integer; dest_loc:integer );

var

  tf_file     :     file of polynomial;
  poly        :     polynomial;
  i           :     integer;

begin

  assign( tf_file, 'TF&POLS.DAT' );
  reset( tf_file );

  seek( tf_file, sorce_loc );
  read( tf_file, poly );
  seek( tf_file, dest_loc );


FILE: COPY.PAS
```

```
  write( tf_file, poly );

  seek( tf_file, ( sorce_loc + 1 ) );
  read( tf_file, poly );
  seek( tf_file, ( dest_loc + 1 ) );
  write( tf_file, poly );

  close( tf_file );

end;

(*******************************************************************
*                                                                  *
*       procedure:      move_poly                                  *
*       version:        2.0                                        *
*       date:           04 September 1985                          *
*       description:    This procedure receives the source and     *
*                       destination polynomial locations and       *
*                       performs the copy.                         *
*       passed variables:       sorce_loc, dest_loc                *
*       files read:             TF&POLS.DAT                        *
*       files written:          TF&POLS.DAT                        *
*       called by:      ccopyy                                     *
*       author:         vincent m. parisi ii, capt, usaf           *
*       modified by:    Gary C. Tarczynski, Capt, USAF             *
*                       Susan K. Mashiko, Capt, USAF               *
*       mod description:  Converted from Pascal MT+ to TURBO       *
*                       Pascal.                                    *
*       mod date:       04 September 1985                          *
*                                                                  *
*******************************************************************)

overlay procedure move_poly( sorce_loc:integer; dest_loc:integer );

var

  poly_file   :     file of polynomial;
  poly        :     polynomial;
  i           :     integer;

begin

  assign( poly_file, 'TF&POLS.DAT' );
  reset( poly_file );

  seek( poly_file, sorce_loc );
  read( poly_file, poly );
  seek( poly_file, dest_loc );
  write( poly_file, poly );
  close( poly_file );

end;

(*******************************************************************
*                                                                  *
*       procedure:      move_matrix                                *
*       version:        2.0                                        *
*       date:           04 September 1985                          *
*       description:    This procedure receives the source and     *
*                       destination matrix locations, reads the    *
*                       source and copies it to the destination.   *
*       passed variables:   sorce_loc, dest_loc                    *
*       files read:         MATRIX.DAT                             *
*       files written:      MATRIX.DAT                             *
*       called by:      ccopyy                                     *
*       author:         vincent m. parisi ii, capt, usaf           *
*       modified by:    Gary C. Tarczynski, Capt, USAF             *
*                       Susan K. Mashiko, Capt, USAF               *
*       mod description:  Converted from Pascal MT+ to TURBO       *
*                       Pascal.                                    *
*       mod date:       04 September 1985                          *
*                                                                  *
*******************************************************************)

overlay procedure move_matrix( sorce_loc:integer; dest_loc:integer );

var

  mat_file    :     file of matrix;
  matrx       :     matrix;
  i           :     integer;

begin

  assign( mat_file, 'MATRIX.DAT' );
  reset( mat_file );

  seek( mat_file, sorce_loc );
  read( mat_file, matrx );
  seek( mat_file, dest_loc );
  write( mat_file, matrx );

  close( mat_file );

end;

(*******************************************************************
*                                                                  *


FILE: COPY.PAS
*       procedure:      ccopyy    (ie copy, called ccopyy due to     *
*                       pascal compiler having internal function     *
*                       called copy)                                 *
*       version:        2.0                                          *
*       date:           22 September 1985                            *
*       description:    This procedure manages the copy function.    *
*                       It determines the source and destination     *
*                       locations of the object to be copied, and    *
*                       then performs the copy operation.            *
*       global variables used:  cmdbuffer                            *
*       global constants used:  as_assigned                          *
*       passed variables:       cmdbuffer                            *
*       procedures called:      clear, gotoxy, trim, out_string,     *
*                               get_location, move_matrix,           *
*                               move_poly, move_tf, highlight,       *
*                               nohighlight, pause, disp_msg         *
*       called by:      select_routine                               *
*       author:         vincent m. parisi ii, capt, usaf             *
*       modified by:    Gary C. Tarczynski, Capt, USAF               *
*                       Susan K. Mashiko, Capt, USAF                 *
*       mod description:  Code was added to check if the source      *
*                       and destination are the same type.  If       *
*                       not, the copy is not performed, an error     *
*                       message is issued, and the user is exited    *
*                       back to the main ICECAP menu.                *
*       mod date:       04 September 1985                            *
*       mod description:  Code was added to for a help option        *
*       mod date:       22 September 85                              *
*                                                                    *
**********************************************************************)

procedure ccopyy( var cmdbuffer : buffer );

var

   i             :     integer;
   source        :     cmdword;
   destination   :     cmdword;
   type_move     :     char;
   dest_loc      :     integer;
   sorce_loc     :     integer;

(***INSERT***INSERT***INSERT***INSERT***INSERT***INSERT***INSERT***

               The following variables were added by
               Mashiko and Tarczynski to compare the
               source and destination types.*)

   type_move1    :     char;


FILE: COPY.PAS
```

```
  type_move2   :     char;

(***INSERT***INSERT***INSERT***INSERT***INSERT***INSERT***INSERT***)

begin

  gotoxy(15,30);
  source := cmdbuffer[2];
  trim( source );
  if source = 'HELP' then
    begin
      clear;
      disp_msg( 17 );
      pause;
      clear;
      exit;
    end
  else
  destination := cmdbuffer[3];
  trim( destination );
  out_string( 'Copying ', as_assigned );
  out_string( source, as_assigned );
  out_string( ' ---> ', as_assigned );
  out_string( destination, as_assigned );

(***INSERT***INSERT***INSERT***INSERT***INSERT***INSERT***INSERT***

               The following code was added by Mashiko
               and Tarczynski to check if the source
               and destination are the same type.  If
               not, an error message is issued and the
               copy is not performed.*)

  get_location( source, sorce_loc, type_move );
    type_move1 := type_move;
  get_location( destination, dest_loc, type_move );
    type_move2 := type_move;

(*  issue error message if types do not match  *)
  if type_move1 <> type_move2 then
    begin
      gotoxy(16,20);
      highlight;
      out_string( 'Mismatched types.  Copy not performed.', as_assigned );
      nohighlight;
      pause;
      exit;
    end
  else


FILE: COPY.PAS
```

```
(***INSERT***INSERT***INSERT***INSERT***INSERT***INSERT***INSERT***)

    if type_move = 'T' then
      move_tf( sorce_loc, dest_loc )
    else
      if type_move = 'p' then
        move_poly( sorce_loc, dest_loc )
      else
        move_matrix( sorce_loc, dest_loc );
  pause;
  gotoxy(15,0);
  out_string( blanks, crt_only );

end;
```

FILE: COPY.PAS

```
(*****************************************************************
******************************************************************
**                                                              **
**     file:      DEFINE.PAS                                    **
**     procedures contained:   get_poly, define                 **
**     version:  1.0                                            **
**     date:      22 Sep 85                                     **
**     description:       This file contains the procedures that **
**                        handle the logic for the definition of **
**                        various inputs: transfer function, matrix, **
**                        polynomial. The various input routines **
**                        are called.                           **
**     author:    Susan K. Mashiko, Capt, USAF                  **
**                Gary C. Tarczynski, Capt, USAF                **
**                                                              **
******************************************************************
*****************************************************************)

(****************************************************************
*                                                               *
*    procedure:    get_poly                                     *
*    version:      1.0                                          *
*    date:         28 Aug 85                                    *
*    description:  This procedure will input a polynomial in either *
*                  factored or polynomial form.                 *
*    global variables used:     abort_command                   *
*    global constants used:     crt_only,  as_assigned,         *
*                               max_deg                         *
*    passed variables:          def_obj, method                 *
*    files written:             TF&POLS.DAT                     *
*    procedures called:         clear,     gotoxy,              *
*                               disp_msg,  out_string,          *
*                               get_int,   disppoly,            *
*                               trim,      pause                *
*    called by:      define                                     *
*    author:         Susan K. Mashiko, Capt, USAF               *
*                    Gary C. Tarczynski, Capt, USAF             *
*                                                               *
****************************************************************)

procedure get_poly( var def_obj : cmdword; var method : cmdword );

var
  pol_deg        :  short_int;
  abort_command  :  boolean;
  stor_loc       :  integer;
  disp_row       :  integer;
  pol            :  polynomial;
  polys          :  file of polynomial;
  i             :  integer;

begin
  abort_command := false;
  clear;
  gotoxy( 10, 5 );
  disp_msg( 30 );

  (* get the order of the polynomial *)
  repeat
    begin
      gotoxy( 10, 58 );
      out_string( '          ', crt_only );
      gotoxy( 10, 58 );
      get_int( pol_deg, abort_command );
      if abort_command then exit;
    end;
  until (( pol_deg >= 0 ) and ( pol_deg <= max_deg ));

  clear;

  gotoxy( 0, 30 );
  disp_msg( 31 );
  gotoxy( 1, 36 );
  out_string( def_obj, as_assigned );

  (* get the polynomial *)
  gotoxy( 2, 34 );
  disp_msg( 32 );
  disp_row := 3;
  trim( method );
  pol.polydeg := pol_deg;
  poly( method, pol, disp_row, abort_command );
  if abort_command then exit;

  (* determine the storage areas for polynomials *)
  if def_obj = 'POLYA' then stor_loc := 18
  else
  if def_obj = 'POLYB' then stor_loc := 19
  else
  if def_obj = 'POLYC' then stor_loc := 20
  else
  if def_obj = 'POLYD' then stor_loc := 21
  else
  if def_obj = 'POLYE' then stor_loc := 22
  else
  if def_obj = 'ONPOLY' then stor_loc := 0
  else
  if def_obj = 'ODPOLY' then stor_loc := 1
```

FILE: DEFINE.PAS

```
  else
  if def_obj = 'CNPOLY' then stor_loc := 2
  else
  if def_obj = 'CDPOLY' then stor_loc := 3
  else
  if def_obj = 'GNPOLY' then stor_loc := 4
  else
  if def_obj = 'GDPOLY' then stor_loc := 5
  else
  if def_obj = 'HNPOLY' then stor_loc := 6
  else
  if def_obj = 'HDPOLY' then stor_loc := 7;

  (* save polynomial to the file *)
  assign( polys, 'tf&pols.dat' );
  reset( polys );
  seek( polys, stor_loc );
  write( polys,  pol );
  close( polys );

  disppoly( def_obj );
  pause;

end;

(**********************************************************************
*                                                                     *
*    procedure:    define                                             *
*    version:      2.0                                                *
*    date:         22 Sep 85                                          *
*    description:  This procedure will call the correct subroutines   *
*                  for the definition of matrices, transfer functions *
*                  and polynomials.                                   *
*    global variables used:    cmdbuffer, strng                       *
*    global variables changed: strng                                  *
*    passed variables:         cmdbuffer, wordnumber                  *
*    procedures called:        trim,         clear,     pause,        *
*                              get_tf,       get_mat,                 *
*                              get_poly,     disp_msg                 *
*    authors:     Susan K. Mashiko, Capt, USAF                        *
*                 Gary C. Tarczynski, Capt, USAF                      *
*    mod description: Added the code for a help option in the primary *
*                 menu level in define.                               *
*    modifier:    Author                                              *
*    mod date:    22 Sep 85                                           *
*                                                                     *
**********************************************************************)

procedure define( var cmdbuffer : buffer;


FILE: DEFINE.PAS
```

```
                     wordnumber : integer );

var
  def_obj : cmdword;
  check   ; cmdword;

begin

  def_obj := cmdbuffer[ 2 ];
  trim( def_obj );
  clear;

  (* Code for help function *)
  check := cmdbuffer[ 3 ];
  trim( check );
  if check = 'HELP' then
    begin
      clear;
      disp_msg( 28 );
      pause;
      clear;
      exit;
    end;

  (* The following code call the transfer function input procedure *)
  if (( def_obj = 'OLTF' ) or ( def_obj = 'CLTF' ) or ( def_obj = 'GTF' ) or
      ( def_obj = 'HTF' ) or ( def_obj = 'TF1' ) or ( def_obj = 'TF2' ) or
      ( def_obj = 'TF3' ) or ( def_obj = 'TF4' ) or ( def_obj = 'TF5' )) then
        get_tf( def_obj, cmdbuffer[ 3 ] );

  (* Code for the help function *)
  if def_obj = 'HELP' then
    begin
      clear;
      disp_msg( 18 );
      pause;
      clear;
    end;

  (* The following code calls the matrix input procedure if the
     first three letters of def_obj are MAT *)
  strng := copy( def_obj, 1, 3 );
  if strng = 'MAT' then
    get_mat( def_obj );

  (* The following code calls the polynomial input procedure
     if the first four letters of def_obj are POLY *)
  strng := copy( def_obj, 1, 4 );
  if strng = 'POLY' then


FILE: DEFINE.PAS
```

```
    get_poly( def_obj, cmdbuffer[ 3 ] );

  (* The following code calls the polynomial input procedure
     if the last four letters of def_obj are POLY *)
  strng := copy( def_obj, 3, 6 );
  if strng = 'POLY' then
    get_poly( def_obj, cmdbuffer[ 3 ] );

(*DELETE***DELETE***DELETE***DELETE***DELETE***DELETE***DELETE***DELETE*

          This section of Parisi's code was deleted by
          Mashiko and Tarczynski.  If a commandword
          contains the string 'TF', then input is han-
          dled by the get_tf procedure above.  These
          three lines of code are not needed.

  strng := copy( def_obj, 1, 2 );
  if strng = 'TF' then
    get_poly( def_obj, cmdbuffer[ 3 ] );

*DELETE***DELETE***DELETE***DELETE***DELETE***DELETE***DELETE***DELETE*)

end;
```

FILE: DEFINE.PAS

```
(***********************************************************************
************************************************************************
**                                                                    **
**    file:     DELROOT.PAS                                           **
**    procedure contained: delroot                                    **
**    version:  2.0                                                   **
**    date:     19 September 85                                       **
**    description:  This file contains the procedures to delete       **
**                  a root from a polynomial. If the root is com-     **
**                  plex the conjugate will also be removed.          **
**    author:       Susan K. Mashiko, Capt, USAF                      **
**                  Gary C. Tarczynski, Capt, USAF                    **
**                                                                    **
************************************************************************
***********************************************************************)

(***********************************************************************
*                                                                      *
*   procedure:    delroot                                              *
*   version:      2.0                                                  *
*   date:         22 September 85                                      *
*   description:  This procedure will delete a root from a polyno-     *
*                 mial. If the root is complex the conjugate will      *
*                 also be removed.                                     *
*   global variables used:     blanks, cmdbuffer, abort_command        *
*   global constants used:     crt_only, as_assigned                   *
*   passed variables:          cmdbuffer, wordnumber                   *
*   files read:                TF&POLS.DAT                             *
*   files written:             TF&POLS.DAT                             *
*   procedures called:         clear,  gotoxy,  disppoly,              *
*                              trim,   highlight,  out_string,         *
*                              nohighlight, get_int,  disp_msg,        *
*                              pause,   clear_msg,  form_poly          *
*   called by:    select                                               *
*   author:       Susan K. Mashiko, Capt, USAF                         *
*                 Gary C. Tarczynski, Capt, USAF                       *
*   modified by:  author                                               *
*   mod description: Code changed to compensate for the call being     *
*                    from lower level in menu structure. And changed   *
*                    message.                                          *
*   mod date:     22 Sep 85                                            *
*                                                                      *
***********************************************************************)

overlay procedure delroot( var cmdbuffer : buffer;
                           var wordnumber : integer );

label once_more;



FILE: DELROOT.PAS
```

```
var
  choice     : cmdword;
  polys      : file of polynomial;
  i          : integer;
  oldpoly    : polynomial;
  newpoly    : polynomial;
  stor_loc   : integer;
  root_num   : integer;

begin
  clear;
  choice := cmdbuffer[ 3 ];
  trim( choice );
  if choice = 'POLYA' then stor_loc := 18
  else
  if choice = 'POLYB' then stor_loc := 19
  else
  if choice = 'POLYC' then stor_loc := 20
  else
  if choice = 'POLYD' then stor_loc := 21
  else
  if choice = 'POLYE' then stor_loc := 22
  else
  if choice = 'ONPOLY' then stor_loc := 0
  else
  if choice = 'ODPOLY' then stor_loc := 1
  else
  if choice = 'CNPOLY' then stor_loc := 2
  else
  if choice = 'CDPOLY' then stor_loc := 3
  else
  if choice = 'GNPOLY' then stor_loc := 4
  else
  if choice = 'GDPOLY' then stor_loc := 5
  else
  if choice = 'HNPOLY' then stor_loc := 6
  else
  if choice = 'HDPOLY' then stor_loc := 7;

  (* pull the desired polynomial from storage *)
  assign( polys, 'tf&pols.dat' );
  reset( polys );
  seek( polys, stor_loc);
  read( polys, oldpoly );
  close( polys );

  (* display the polynomial and on the same screen ask *)
  (* which root should be eliminated                   *)
  disppoly( choice );


FILE: DELROOT.PAS
```

```
  gotoxy( 20, 0 );
  out_string( blanks, crt_only );
  gotoxy( 20, 5 );
  highlight;
  out_string( 'The number of the root you wish to delete is...',
            as_assigned );
  nonhighlight;
  once_more:
  gotoxy( 20, 52 );
  out_string( '        ', crt_only );
  gotoxy( 20, 53 );
  get_int( root_num, abort_command );
  if abort_command then exit;
  if (( root_num > oldpoly.polydeg ) or ( root_num < 0 )) then
    begin
      gotoxy( 21, 5 );
      disp_msg( 9 );
      pause;
      gotoxy( 21, 0 );
      clear_msg( 9 );
      goto once_more;
    end;

  (* if the root is complex you want to eliminate both parts *)
  if oldpoly.polyfact[ root_num ].imagpart < 0 then
    begin
      for i := 1 to ( root_num - 1 ) do
        begin
          newpoly.polyfact[ i ].realpart :=
                          oldpoly.polyfact[ i ].realpart;
          newpoly.polyfact[ i ].imagpart :=
                          oldpoly.polyfact[ i ].imagpart;
        end;
      if root_num >= ( oldpoly.polydeg - 2 ) then
      begin
        for i := root_num to ( oldpoly.polydeg  - 2 ) do
          begin
            newpoly.polyfact[ i ].realpart := oldpoly.polyfact[ i + 2
].realpart;
            newpoly.polyfact[ i ].imagpart := oldpoly.polyfact[ i + 2
].imagpart;
          end;
      end;
      newpoly.polydeg := oldpoly.polydeg - 2;
    end;

  if oldpoly.polyfact[ root_num ].imagpart > 0 then
    begin
      for i := 1 to ( root_num - 2 ) do
```

FILE: DELROOT.PAS

```
        begin
          newpoly.polyfact[ i ].realpart :=
                          oldpoly.polyfact[ i ].realpart;
          newpoly.polyfact[ i ].imagpart :=
                          oldpoly.polyfact[ i ].imagpart;
        end;
        if root_num >= ( oldpoly.polydeg - 2 ) then
        begin
          for i := ( root_num - 1 ) to ( oldpoly.polydeg  - 2 ) do
            begin
              newpoly.polyfact[ i ].realpart :=
                          oldpoly.polyfact[ i + 2 ].realpart;
              newpoly.polyfact[ i ].imagpart :=
                          oldpoly.polyfact[ i + 2 ].imagpart;
            end;
        end;
        newpoly.polydeg := oldpoly.polydeg - 2;
    end;

  (* if there is no imaginary part only eliminate a single root *)
  if oldpoly.polyfact[ root_num ].imagpart = 0 then
    begin
      for i := 1 to ( root_num - 1 ) do
        begin
          newpoly.polyfact[ i ].realpart := oldpoly.polyfact[ i ].realpart;
          newpoly.polyfact[ i ].imagpart := oldpoly.polyfact[ i ].imagpart;
        end;
      for i := root_num to ( oldpoly.polydeg  - 1 ) do
        begin
          newpoly.polyfact[ i ].realpart := oldpoly.polyfact[ i + 1 ].realpart;
          newpoly.polyfact[ i ].imagpart := oldpoly.polyfact[ i + 1 ].imagpart;
        end;
      newpoly.polydeg := oldpoly.polydeg - 1;
    end;

  newpoly.coefficient := oldpoly.coefficient;

  (* form the polynomial *)
  form_poly( newpoly );

  (* store the new polynomial in the same stor_loc as the old *)
  assign( polys, 'tf&pols.dat' );
  reset( polys );
  seek( polys, stor_loc);
  write( polys, newpoly );

  (* display the new polynomial *)
  disppoly( choice );
  pause;


FILE: DELROOT.PAS
```

```
end;
```

FILE: DELROOT.PAS

```
(**********************************************************************
***********************************************************************
**                                                                   **
**     file:         DISP.PAS                                        **
**     procedures contained:  disp, disptf                           **
**     version:      3.0                                             **
**     date:         6 November 85                                   **
**     description:  This file contains the procedures that handle   **
**                   the logic to display the various DISPLAY        **
**                   options on the screen.                          **
**     authors:      Susan K. Mashiko, Capt, USAF                    **
**                   Gary C. Tarczynski, Capt, USAF                  **
**                                                                   **
***********************************************************************
**********************************************************************)

(***********************************************************************
*                                                                      *
*      procedure:   disptf                                             *
*      version:     1.0                                                *
*      date:        25 September 1985                                  *
*      description: This procedure will display the requested trans-   *
*                   fer function on the screen. The displayed func-    *
*                   tion shall be taken from the designated storage    *
*                   location.                                          *
*      global constants used:  as_assigned                             *
*      passed variables:       disp_obj                                *
*      files read:             TF&POLS.DAT                             *
*      procedures called:      trim,          gotoxy,                  *
*                              disp_msg,      out_string,              *
*                              make_pretty,  out_real,                 *
*                              clear,         pause                    *
*      called by:   disp                                               *
*      authors:     Susan K. Mashiko, Capt, USAF                       *
*                   Gary C. Tarczynski, Capt, USAF                     *
*                                                                      *
***********************************************************************)

procedure disptf;    (* forward referenced from gettf *)
                     (*  ( var disp_obj : cmdword );  *)

var
  stor_loc  : integer;
  numerator : polynomial;
  denominator :  polynomial;
  polys     : file of polynomial;
  i         : integer;
  row       : integer;
  number    : real;


FILE: DISP.PAS
```

```
begin
  if disp_obj = 'OLTF'  then stor_loc := 0
  else
  if disp_obj = 'CLTF'  then stor_loc := 2
  else
  if disp_obj = 'GTF'   then stor_loc := 4
  else
  if disp_obj = 'HTF'   then stor_loc := 6
  else
  if disp_obj = 'TF1'  then stor_loc := 8
  else
  if disp_obj = 'TF2'  then stor_loc := 10
  else
  if disp_obj = 'TF3'   then stor_loc := 12
  else
  if disp_obj = 'TF4'  then stor_loc := 14
  else
  if disp_obj = 'TF5'  then stor_loc := 16;

  assign( polys, 'tf&pols.dat' );
  reset( polys );
  seek( polys, stor_loc );
  read( polys, numerator );
  seek( polys, (stor_loc + 1));
  read( polys, denominator );
  close( polys );

  (* put the title on the first page of the display *)
  gotoxy( 0, 27 );
  disp_msg( 33 );
  gotoxy( 1, 37 );
  out_string( disp_obj, as_assigned );
  gotoxy( 2, 34 );
  disp_msg( 6 );
  row := 3;

  (* draw the form on the screen *)
  make_pretty( row, numerator.polydeg );
  i := 1;

  (* get the term's coefficient and display it *)
  number := numerator.coefficient;
  gotoxy( ( row + 2 ), 19 );
  out_real( number, 12, as_assigned );
  gotoxy( ( row + 2 ), 57 );
  out_real( number, 12, as_assigned );

  (* get the numerator and display in factored form *)
  while i <= numerator.polydeg do


FILE: DISP.PAS
```

```
  begin
    gotoxy( ( row + 3 + i ), 43 );
    out_real( numerator.polyfact[ i ].realpart, 12, as_assigned );
    gotoxy( ( row + 3 + i ), 59 );
    out_real( numerator.polyfact[ i ].imagpart, 12, as_assigned );
    i := i + 1;
  end;  (* end of while loop *)

(* now display the polynomial form of the numerator *)
i := 1;
while i <= ( numerator.polydeg + 1 ) do
  begin
    gotoxy( ( row + 3 + i ), 7 );
    out_real( numerator.polypoly[ i ], 12, as_assigned );
    i := i + 1;
  end;
pause;

(* if the numerator and denominator degrees combined are greater *)
(* than 7 the denominator will be displayed on the next page     *)
if ( numerator.polydeg + denominator.polydeg ) <= 7 then
  begin
    row := numerator.polydeg + 9;
    gotoxy( ( row - 1 ), 33);
  end
else
  begin
    clear;
    gotoxy( 1, 36);
    out_string( disp_obj, as_assigned );
    gotoxy( 2, 33 );
    row := 3;
  end;

(* get the denominator of the transfer function *)
disp_msg( 7 );
make_pretty( row, denominator.polydeg );

(* get the term's coefficient and display it *)
number := denominator.coefficient;
gotoxy( ( row + 2 ), 19 );
out_real( number, 12, as_assigned );
gotoxy( ( row + 2 ), 57 );
out_real( number, 12, as_assigned );

(* get the denominator and display in factored form *)
i := 1;
while i <= denominator.polydeg do
  begin
```

```
      gotoxy( ( row + 3 + i ), 43 );
      out_real( denominator.polyfact[ i ].realpart, 12, as_assigned );
      gotoxy( ( row + 3 + i ), 59 );
      out_real( denominator.polyfact[ i ].imagpart, 12, as_assigned );
      i := i + 1;
    end;  (* end of while loop *)

  (* now display the polynomial form of the denominator *)
  i := 1;
  while i <= ( denominator.polydeg + 1 ) do
    begin
      gotoxy( ( row + 3 + i ), 7 );
      out_real( denominator.polypoly[ i ], 12, as_assigned );
      i := i + 1;
    end;
  pause;
end;

(**********************************************************************
*                                                                     *
*    procedure:    disp                                               *
*    version:      2.0                                                *
*    date:         6 November 85                                      *
*    description:  This procedure contains the logic to display the   *
*                  selected DISPLAY option on the screen.             *
*    global variables used:   cmdbuffer                               *
*    passed variables:        cmdbuffer, wordnumber                   *
*    procedures called:       disptf, trim, ppoly, mmatrix,           *
*                             clear, disp_msg, pause                  *
*    called by:    select                                             *
*    authors:      Susan K. Mashiko, Capt, USAF                       *
*                  Gary C. Tarczynski, Capt, USAF                     *
*    mod description: tells the user when an option is not available  *
*    mod date:        6 November 85                                   *
*                                                                     *
**********************************************************************)

procedure disp( var cmdbuffer : buffer;
                var wordnumber : integer);

var
  disp_obj  : cmdword;

begin
  disp_obj :=  cmdbuffer[ 2 ];
  trim( disp_obj );
  clear;

  (* catch code for the display of transfer functions *)


FILE: DISP.PAS
```

```
    if ( ( disp_obj = 'OLTF' ) or ( disp_obj = 'CLTF' ) or
        ( disp_obj = 'GTF' ) or (disp_obj = 'HTF' )) then
        disptf( disp_obj")
    else
    if disp_obj = 'POLY' then
        ppoly( cmdbuffer, number_of_commands )
    else
    if disp_obj = 'MATRIX' then
        mmatrix( cmdbuffer, number_of_commands )
    else
    if disp_obj = 'HELP' then
      begin
        clear;
        disp_msg( 19 );
        pause;
        clear;
      end
    else
      begin
        clear;
        gotoxy(8,30);
        out_string(disp_obj, as_assigned);
        gotoxy(10,17);
        out_string('This routine is not implemented yet.',as_assigned);
        pause;
        exit;
      end;
  end;
```

FILE: DISP.PAS

```
(*********************************************************************
**********************************************************************
**                                                                  **
**      file:              DISPLAYC.PAS                             **
**      procedures contained:  display_commandword                  **
**      version:           1.1                                      **
**      date:              30 June 1984                             **
**      description:       This file displays the commandword      **
**                         pointed to by word_num.                  **
**      author:            vincent m. parisi ii, capt., usaf        **
**                                                                  **
**********************************************************************
*********************************************************************)

(*********************************************************************
*                                                                    *
*       procedure:        displa_commandword                         *
*       version:          1.1                                        *
*       date:             30 June 1984                               *
*       description:      this procedure displays the commandword   *
*                         pointed to by word_num.                    *
*       global variables used:  cmdbuffer                            *
*       global constants used:  wordsize, buffersize                 *
*       procedures called:      outstring, trim                      *
*       called by:        get_com                                    *
*       author:           vincent m. parisi ii, capt., usaf          *
*       modifier:         Paul A. Moore, Capt, USAF                  *
*                                                                    *
*********************************************************************)

procedure displa_commandword(cmdbuffer : buffer; word_num : integer );

var     cmd_word        :       cmdword;

begin

  cmd_word := cmdbuffer[ word_num ];
  trim( cmd_word );
  out_string( cmd_word, 'a' );
  out_string( ' ', 'a' );

end;
```

FILE: DISPLAYC.PAS

```
(******************************************************************
*******************************************************************
**                                                               **
**    file:         FORM.PAS                                     **
**    procedures contained:  form,  poly_into_storage,           **
**                           poly_from_storage                   **
**    version:      1.0                                          **
**    date:         7 October 85                                 **
**    description:  This file contains the procedures to form OLTF's**
**                  and CLTF's                                   **
**    author:       Susan K. Mashiko, Capt, USAF                 **
**                  Gary C. Tarczynski, Capt, USAF               **
**                                                               **
*******************************************************************
******************************************************************)

(******************************************************************
*                                                                 *
*   procedure:    poly_from_storage                               *
*   version:      1.0                                             *
*   date:         7 October 85                                    *
*   description:  This file contains the procedures to get poly-  *
*                 nomial from storage                             *
*   passed variables:          choice, pol                        *
*   returned variables:        pol                                *
*   files read:                TF&POLS.DAT                        *
*   procedures called:         trim                               *
*   called by:    form                                            *
*   author:       Susan K. Mashiko, Capt, USAF                    *
*                 Gary C. Tarczynski, Capt, USAF                  *
*                                                                 *
******************************************************************)

procedure poly_from_storage( var choice : cmdword ;
                             var pol : polynomial );

var
  polys    : file of polynomial;
  stor_loc : integer;

begin
  trim( choice );
  if choice = 'POLYA' then stor_loc := 18
  else
  if choice = 'POLYB' then stor_loc := 19
  else
  if choice = 'POLYC' then stor_loc := 20
  else
  if choice = 'POLYD' then stor_loc := 21


FILE: FORM.PAS
```

```
  else
  if choice = 'POLYE' then stor_loc := 22
  else
  if choice = 'ONPOLY' then stor_loc := 0
  else
  if choice = 'ODPOLY' then stor_loc := 1
  else
  if choice = 'CNPOLY' then stor_loc := 2
  else
  if choice = 'CDPOLY' then stor_loc := 3
  else
  if choice = 'GNPOLY' then stor_loc := 4
  else
  if choice = 'GDPOLY' then stor_loc := 5
  else
  if choice = 'HNPOLY' then stor_loc := 6
  else
  if choice = 'HDPOLY' then stor_loc := 7;

  assign( polys, 'tf&pols.dat' );
  reset( polys );
  seek( polys, stor_loc);
  read( polys, pol );

  close( polys );

end;

(*********************************************************************
*                                                                    *
*   procedure:    poly_into_storage                                  *
*   version:      1.0                                                *
*   date:         7 October 85                                       *
*   description:  This file contains the procedures to place a poly- *
*                 nomial into storage                                *
*   passed variables:         choice, pol                            *
*   returned variables:       pol                                    *
*   files written;    "       TF&POLS.DAT                            *
*   procedures called:        trim                                   *
*   called by:    form                                               *
*   author:       Susan K. Mashiko, Capt, USAF                       *
*                 Gary C. Tarczynski, Capt, USAF                     *
*                                                                    *
*********************************************************************)

procedure poly_into_storage( var choice : cmdword ;
                             var pol : polynomial );

var


FILE: FORM.PAS
```

```
           file of polynomial;
           integer;

  trim( choice );
  if choice = 'POLYA' then stor_loc := 18
  else
  if choice = 'POLYB' then stor_loc := 19
  else
  if choice = 'POLYC' then stor_loc := 20
  else
  if choice = 'POLYD' then stor_loc := 21
  else
  if choice = 'POLYE' then stor_loc := 22
  else
  if choice = 'ONPOLY' then stor_loc := 0
  else
  if choice = 'ODPOLY' then stor_loc := 1
  else
  if choice = 'CNPOLY' then stor_loc := 2
  else
  if choice = 'CDPOLY' then stor_loc := 3
  else
  if choice = 'GNPOLY' then stor_loc := 4
  else
  if choice = 'GDPOLY' then stor_loc := 5
  else
  if choice = 'HNPOLY' then stor_loc := 6
  else
  if choice = 'HDPOLY' then stor_loc := 7;

  assign( polys, 'tf&pols.dat' );
  reset( polys );
  seek( polys, stor_loc);
  write( polys, pol );

  close( polys );

end;

(**********************************************************************
*                                                                     *
*   procedure:    form                                                *
*   version:      1.0                                                 *
*   date:         7 October 85                                        *
*   description:  This file contains the procedures to form OLTF's    *
*                 and CLTF's                                          *
*   global variables used:     abort_command                          *
*   global constants used:     crt_only                               *


FILE: FORM.PAS
*   procedures called:          clear,        gotoxy,                  *
*                               disp_msg,     out_string,              *
*                               get_int,      polymlt,                 *
*                               pause,        clear_msg,               *
*                               poly_from_storage,  highlight,         *
*                               poly_into_storage,  nohighlight,       *
*                               spolymlt, polyadd, disptf              *
*   called by:     select                                              *
*   author:        Susan K. Mashiko, Capt, USAF                        *
*                  Gary C. Tarczynski, Capt, USAF                      *
*                                                                      *
************************************************************************)

(* NOTE: the procedure disptf was forward referenced in the  *)
(*       file gettf. If you changed the relative postion of  *)
(*       that file to this one insure the reference preceeds *)
(*       this file                                           *)

procedure form;

label
  abort,  abort2,  repeat_again;

var
  selection       : integer;
  gnpol, hnpol    : polynomial;
  onpol           : polynomial;
  gdpol, hdpol    : polynomial;
  odpol           : polynomial;
  cnpol, cdpol    : polynomial;
  temppol         : polynomial;
  choice          : cmdword;
  gain            : real;


begin
  (* get the selection from the user *)
  clear;
  repeat
    begin
      gotoxy( 5, 0 );
      disp_msg( 59 );
      gotoxy( 12, 30 );
      out_string('           ', crt_only );
      gotoxy( 12, 30 );
      get_int( selection, abort_command );
      if abort_command then exit;
      if (( selection > 4 ) or ( selection < 1 )) then
        begin


FILE: FORM.PAS
```

```
          gotoxy( 14, 5 );
          disp_msg( 9 );
          pause;
          gotoxy( 14, 5 );
          clear_msg( 9 );
        end;
    end;
  until (( selection > 0 ) and ( selection < 5 ));

  (* selection 1 forms an OLTF from the GTF and the HTF *)
  if selection = 1 then
    begin
      choice := 'GNPOLY';
      poly_from_storage( choice, gnpol );
      choice := 'HNPOLY';
      poly_from_storage( choice, hnpol );
      choice := 'GDPOLY';
      poly_from_storage( choice, gdpol );
      choice := 'HDPOLY';
      poly_from_storage( choice, hdpol );

      (* check to see if the resulting tf will have a degree *)
      (* greater than 10                                      *)
      if ( gnpol.polydeg + hnpol.polydeg ) > 10 then
        goto abort;
      if ( gnpol.polydeg + hnpol.polydeg ) > 10 then
        begin
          abort:
          clear;
          gotoxy( 8, 10 );
          highlight;
          writeln(' Degree of result greater than 10, option aborted ');
          nohighlight;
          writeln('          Due to the storage space limitations your
resulting ');
          writeln('          polynomial is limited to 10 th order');
          exit;
        end
      else
        begin
          polymlt( gnpol, hnpol, onpol );
          polymlt( gdpol, hdpol, odpol );

          (* gain change code commented out for phase 1 *)
        { gotoxy( 14, 0 );
          writeln('     OPEN-LOOP GAIN = GAIN * ( OLN-GAIN / OLD-GAIN ) ');
          writeln('     GAIN =');
          writeln('     Enter <CR> for default value of 1 ');



FILE: FORM.PAS
```

```
          (* get the gain from the user *)
          repeat_again:
          gotoxy( 15, 13 );
          out_string('           ', crt_only );
          gotoxy( 15, 13 );
          get_r_num( gain, 15, 13, abort_command );
          if abort_command then exit;

          onpol.coefficient := gain * ( onpol.coefficient / odpol.coefficient
);
          odpol.coefficient := 1.0;   }

          choice := 'ONPOLY';
          poly_into_storage( choice, onpol );
          choice := 'ODPOLY';
          poly_into_storage( choice, odpol );
          choice := 'OLTF';
          clear;
          disptf( choice );
        end;
    end;

  (* this selection forms the CLTF from GTF and HTF   *)
  (* CLTF = ( GAIN * GTF ) / ( 1 + GAIN * GTF * HTF ) *)
  if selection = 2 then
    begin
      choice := 'GNPOLY';
      poly_from_storage( choice, gnpol );
      choice := 'HNPOLY';
      poly_from_storage( choice, hnpol );
      choice := 'GDPOLY';
      poly_from_storage( choice, gdpol );
      choice := 'HDPOLY';
      poly_from_storage( choice, hdpol );

      (* check to see if the resulting tf will have  *)
      (* a degree greater than 10                    *)
      if ( gnpol.polydeg + hnpol.polydeg ) > 10 then
        goto abort;
      if ( gnpol.polydeg + hnpol.polydeg ) > 10 then
        begin
          abort2:
          clear;
          gotoxy( 8, 10 );
          highlight;
          writeln(' Degree of result greater than 10, option aborted ');
          nohighlight;
          riteln('          Due to the storage space limitations your
resulting ');


FILE: FORM.PAS
```

```
          writeln('          polynomial is limited to 10 th order');
          exit;
        · end
      else
        begin
          polymlt( gnpol, hnpol, cnpol );

          (* gain change code commented out for phase 1 *)
        { gotoxy( 14, 0 );
          writeln('     CLOSED-LOOP GAIN = GAIN * ( CLN-GAIN / CLD-GAIN ) ');
          writeln('     GAIN =');
          writeln('     Enter real number or default value of 1 ');

          (* get the gain from the user *)
          repeat_again:
          gotoxy( 15, 13 );
          out_string('            ', crt_only );
          gotoxy( 15, 13 );
          get_r_num( gain, 15, 13, abort_command );
          if abort_command then exit;

          cnpol.coefficient := gain * ( cnpol.coefficient / cdpol.coefficient
);
          cdpol.coefficient := 1.0;   }

          gain := 1;
          spolymlt( cnpol, temppol, gain );
          polymlt( gdpol, hdpol, cnpol );
          polyadd( cnpol, temppol, cdpol );
          polymlt( gnpol, hdpol, temppol );
          spolymlt( temppol, cnpol, gain );

          choice := 'CNPOLY';
          poly_into_storage( choice, cnpol );
          choice := 'CDPOLY';
          poly_into_storage( choice, cdpol );
          choice := 'CLTF';
          clear;
          disptf( choice );
        end;
  end;

  (* selection 3 forms the CLTF from the OLTF *)
  if selection = 3 then
    begin
      choice := 'ONPOLY';
      poly_from_storage( choice, onpol );
      choice := 'ODPOLY';
      poly_from_storage( choice, odpol );
```

FILE: FORM.PAS

```
    (* gain change code commented out for phase 1 *)
  { gotoxy( 14, 0 );
    writeln('     CLOSED-LOOP GAIN = GAIN * ( CLN-GAIN / CLD-GAIN ) ');
    writeln('     GAIN =');
    writeln('     Enter real number or default value of 1 ');

    (* get the gain from the user *)
    repeat_again:
    gotoxy( 15, 13 );
    out_string('           ', crt_only );
    gotoxy( 15, 13 );
    get_r_num( gain, 15, 13, abort_command );
    if abort_command then exit;

    cnpol.coefficient := gain * ( cnpol.coefficient / cdpol.coefficient );
    cdpol.coefficient := 1.0;   }

    gain := 1;

    spolymlt( onpol, cnpol, gain );
    polyadd( cnpol, odpol, cdpol );

    choice := 'CNPOLY';
    poly_into_storage( choice, cnpol );
    choice := 'CDPOLY';
    poly_into_storage( choice, cdpol );
    choice := 'CLTF';
    clear;
    disptf( choice );
end;

(* selection 4 forms the CLTF from the GTF and the HTF in parallel *)
if selection = 4 then
  begin
    choice := 'GNPOLY';
    poly_from_storage( choice, gnpol );
    choice := 'HNPOLY';
    poly_from_storage( choice, hnpol );
    choice := 'GDPOLY';
    poly_from_storage( choice, gdpol );
    choice := 'HDPOLY';
    poly_from_storage( choice, hdpol );

    polymlt( gnpol, hdpol, temppol );

    (* gain change code commented out for phase 1 *)
  { gotoxy( 14, 0 );
    writeln('     CLOSED-LOOP GAIN = GAIN * ( CLN-GAIN / CLD-GAIN ) ');
    writeln('     GAIN =');
```

FILE: FORM.PAS

```
      writeln('     Enter real number or default value of 1 ');

      (* get the gain from the user *)
      repeat_again:
      gotoxy( 15, 13 );
      out_string('            ', crt_only );
      gotoxy( 15, 13 );
      get_r_num( gain, 15, 13, abort_command );
      if abort_command then exit;

      cnpol.coefficient := gain * ( cnpol.coefficient / cdpol.coefficient );
      cdpol.coefficient := 1.0;   }

      gain := 1;

      polymlt( gdpol, hnpol, cdpol );
      polyadd( temppol, cdpol, cnpol );
      polymlt( gdpol, hdpol, cdpol );

      choice := 'CNPOLY';
      poly_into_storage( choice, cnpol );
      choice := 'CDPOLY';
      poly_into_storage( choice, cdpol );
      choice := 'CLTF';
      clear;
      disptf( choice );

    end; (* end of selection 4 *)

end;     (* end of procedure *)
```

FILE: FORM.PAS

```
(*****************************************************************
******************************************************************
**                                                              **
**      file:           GETCOM.PAS                              **
**      procedures contained:   get_cmd                         **
**      version:        3.1                                     **
**      date:           16 august 1983                          **
**      description:    This file contains the procedure        **
**                      get_cmd which handles all processing    **
**                      associated with getting a valid command **
**                      from the user.  It is called by the     **
**                      program and operation remains here      **
**                      until a valid command is entered.       **
**      author:         vincent m. parisi ii, capt., usaf       **
**                                                              **
******************************************************************
*****************************************************************)

(*****************************************************************
*                                                                *
*       procedure:      get_cmd                                  *
*       version:        3.1                                      *
*       date:           16 august 1983                           *
*       description:    This procedure handles all processing    *
*                       associated with getting a valid command  *
*                       from the user.  It is called by the      *
*                       program and operation is maintained      *
*                       here until a decoded and validated com-  *
*                       mand is entered.                         *
*       global variables used:  help_level, cmdbuffer,           *
*                               call_routine, abort_command      *
*       global variables changed:  abort_command                 *
*       global constants used:  yes                              *
*       passed variables:       cmdbuffer, call_routine,         *
*                               num_of_commands                  *
*       returned variables:     num_of_commands                  *
*       procedures called:      gotoxy, readcom, get_line,       *
*                               val_n_dec, prompt_help,          *
*                               displa_commandword, prompt_cmd,  *
*                               instruction, proces_error, clear *
*       called by:      ICECAPPC                                 *
*       author:         vincent m. parisi ii, capt., usaf        *
*                                                                *
*****************************************************************)

procedure g   cmd( var cmdbuffer : buffer; var call_routine : cmdword ;
                   var num_of_commands : integer );

const


FILE: GETCOM.PAS
```

```
        pr_cmd_row      =          11;
        pr_cmd_col      =           5;
        pr_hlp_row      =           5;
        cmd_row         =          11;
        cmd_col         =          20;
        instr_row       =           2;
        instr_col       =           5;

var     i               :       integer;
        level           :       integer;
        rec_num         :       integer;
        abort_command   :       boolean;
        bufferpointer   :       integer;
        error_code      :       char;

begin

  abort_command := yes;         (* initialize so first level of command
                                   words are displayed.                *)
  error_code    := 'a';

  repeat

    if abort_command = yes then
      begin
        bufferpointer := 1;     (* set bufferpointer on initial entry and when
                                   user wanted to abort previous command.   *)
        rec_num := 1;
        get_line( decode, rec_num );    (* get first dictionary entry   *)
        level := 1;                     (* initialize for instruction   *)
                                        (* and valndec                  *)
      end;

    clear;                              (* clear the screen of everything  *)

    if help_level = 3 then              (* issue instructions based on help
                                           level       *)
      instruction( level, instr_row, instr_col );

    if help_level > 1 then
      prompt_help( rec_num, pr_hlp_row ); (* display the appropriate command *)
                                 (* words based on pointer(s) in decode
*)

    prompt_cmd( pr_cmd_row, pr_cmd_col );       (* put up the logo      *)


    (* display the contents of the command buffer. if it is empty, nothing *)
    (* will be displayed, but if there are some commands in it form an unre-*)


FILE: GETCOM.PAS
```

```
    (* solved command, then display them.                              *)

    gotoxy( cmd_row, cmd_col );          (* position for command        *)

    for i := 1 to ( bufferpointer - 1 ) do
      displa_commandword( cmdbuffer,i );

    abort_command := no;        (* set abort command for read command   *)

    (* get command from user     *)
    num_of_commands := 0;
    readcom( cmdbuffer, bufferpointer, abort_command );

    if (( abort_command = no ) and ( bufferpointer > 1 )) then

      begin
                          (* set parameters for entry into vali-  *)
                          (* date and decode (val_n_dec)          *)
        num_of_commands := ( bufferpointer - 1 );
        rec_num         := 1;
        level           := 1;    (* enter in with first commandword     *)
        error_code      := 'a'; (* initial code, not really an error    *)

                          (* now decode the entered command       *)
        val_n_dec( level, rec_num, error_code, num_of_commands, cmdbuffer,
                          call_routine );

        if ( error_code = 'b' ) then
          begin
            if help_level > 1 then
              begin
                gotoxy( cmd_row, cmd_col );
                proces_error( error_code, level, cmdbuffer, bufferpointer );
              end;
            bu'ferpointer := level;     (* get word that is bad          *)
          end;

      end;

  until (error_code = 'n') or (error_code = 'c');

end;
```

FILE: GETCOM.PAS

```
(*******************************************************************
********************************************************************
**                                                                **
**      file:           GETDAT.PAS                                **
**      procedure contained:  get_data, bld_stat_line,            **
**                            title_slide                         **
**      version:        2.0                                       **
**      date:           22 July 85                                **
**      description:    This file contains the procedures that    **
**                      read the DATA.DAT file, initialize the    **
**                      program variables, initialize and build   **
**                      the status line, and display the title    **
**                      slide.                                    **
**      author:         vincent m. parisi ii, capt., usaf         **
**                      Susan K. Mashiko, Capt, USAF              **
**                      Gary C. Tarczynski, Capt, USAF            **
**                                                                **
********************************************************************
*******************************************************************)

(*******************************************************************
*                                                                  *
*       procedure:      title_slide                                *
*       version:        3.0                                        *
*       date:           22 July 85                                 *
*       description:    This procedure displays the system title   *
*                       slide.  By this, it demonstrates that at   *
*                       least the terminal control codes have been *
*                       initialized properly, and probably the     *
*                       rest of the parameters.                    *
*       passed variables:       term_dat                           *
*       procedures called:      clear, gotoxy,  highlight,         *
*                               nohighlight, rectangle             *
*       called by:      get_dat                                    *
*       author:         Gary C. Tarczynski, Capt, USAF             *
*                       Susan K. Mashiko, Capt, USAF               *
*                                                                  *
*******************************************************************)

procedure title_slide( var term_dat : term_array );

  begin
    clear;
    gotoxy(2,34);
      write(' WELCOME TO ');
    rectangle(4,19,41,7);

(*---------- begin writing "ICECAP" in big letters ----------*)
    highlight;
```

FILE: GETDAT.PAS

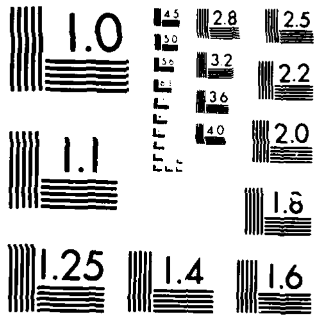
```
    gotoxy(5,21);  write('   ');
    gotoxy(5,26);  write('     ');
    gotoxy(5,33);  write('    ');
    gotoxy(5,39);  write('     ');
    gotoxy(5,46);  write('     ');
    gotoxy(5,53);  write('     ');

    gotoxy(6,22);  write(' ');
    gotoxy(6,26);  write(' ');
    gotoxy(6,30);  write(' ');
    gotoxy(6,33);  write(' ');
    gotoxy(6,39);  write(' ');
    gotoxy(6,43);  write(' ');
    gotoxy(6,46);  write(' ');
    gotoxy(6,50);  write(' ');
    gotoxy(6,53);  write(' ');
    gotoxy(6,57);  write(' ');

    gotoxy(7,22);  write(' ');
    gotoxy(7,26);  write(' ');
    gotoxy(7,33);  write('   ');
    gotoxy(7,39);  write(' ');
    gotoxy(7,46);  write(' ');
    gotoxy(7,50);  write(' ');
    gotoxy(7,53);  write('     ');

    gotoxy(8,22);  write(' ');
    gotoxy(8,26);  write(' ');
    gotoxy(8,30);  write(' ');
    gotoxy(8,33);  write(' ');
    gotoxy(8,39);  write(' ');
    gotoxy(8,43);  write(' ');
    gotoxy(8,46);  write('     ');
    gotoxy(8,53);  write(' ');

    gotoxy(9,21);  write('   ');
    gotoxy(9,26);  write('     ');
    gotoxy(9,33);  write('    ');
    gotoxy(9,39);  write('     ');
    gotoxy(9,46);  write(' ');
    gotoxy(9,50);  write(' ');
    gotoxy(9,53);  write(' ');
    nohighlight;
(*---------- end writing "ICECAP" in big letters ----------*)

    gotoxy(12,11);
      write(' INTERACTIVE CONTROL ENGINEERING COMPUTER ANALYSIS PACKAGE ');
    gotoxy(14,26);
      write(' ZENITH Z-100 - VERSION 1.0 ');


FILE: GETDAT.PAS
```

```
rectangle(16,4,42,6);
  gotoxy(17,5);
    write(' DEVELOPED AT: ');
  gotoxy(18,5);
    write(' The Air Force Institute of Technology ');
  gotoxy(19,5);
    write(' Electrical Engineering Dept ');
  gotoxy(20,5);
    write(' Wright-Patterson AFB, OH  45433 ');
  gotoxy(22,21);
    highlight;
    write('   >>>> Press <CR> Key to Continue... <<<<    ');
    nohighlight;
    readln;
  gotoxy(5,20);
    write('           COPYRIGHT 1985              ');
  gotoxy(6,20);
    write('                                       ');
  gotoxy(7,20);
    write(' WRITTEN BY:  Capt Susan K. Mashiko    ');
  gotoxy(8,20);
    write('              Capt Gary C. Tarczynski  ');
  gotoxy(9,20);
    write(' MENU DEVELOPED BY: Capt Paul A. Moore ');
  gotoxy(17,5);
    write('For more information on ICECAP, contact:');
  gotoxy(18,5);
    write('     Dr. Gary B. Lamont                 ');
  gotoxy(19,5);
    write('     Electrical Engineering Dept        ');
  gotoxy(20,5);
    write('     Air Force Institute of Technology  ');
end;

(**********************************************************************
*                                                                     *
*       procedure:      bld_stat_line                                 *
*       version:        1.2                                           *
*       date:           18 oct 83                                     *
*       description:    This module builds the status line from       *
*                       initialization data from disk storage.        *
*                       Data is in param group one.                   *
*       global variables used:          status_line, help_level,      *
*                                       temp, printer, trans          *
*       global variables changed:       status_line                   *
*       passed variables:               help_level, temp, printer,    *
*                                       trans                         *
*       called by:                      get_dat                       *
*       author:         vincent m. parisi ii, capt., usaf             *

FILE: GETDAT.PAS
```

```
*                                                                      *
************************************************************************)

procedure bld_stat_line
                ( help_level : integer; temp : boolean; printer : boolean;
                        trans : boolean );
var     help    :       char;
        on_off  :       string[ 3 ];
begin
  status_line := concat( status_line, '  Help level = ' );
  if help_level = 3 then help := '3'
  else
  if help_level = 2 then help := '2'
  else
  help := '1';
  status_line := concat( status_line, help );

  status_line := concat( status_line, '  Echo Print - ' );
  if printer then on_off := 'ON '
  else
  on_off := 'OFF';
  status_line := concat( status_line, on_off );

  status_line := concat( status_line, '  Transaction copy - ' );
  if trans then on_off := 'ON '
  else
  on_off := 'OFF';
  status_line := concat( status_line, on_off );

  status_line := concat( status_line, '  Temporary - ' );
  if temp then un_off := 'ON '
  else
  on_off := 'OFF';
  status_line := concat( status_line, on_off );
end;

(***********************************************************************
*                                                                      *
*       procedure:      get_data                                       *
*       version:        4.0                                            *
*       date:           22 July 85                                     *
*       description:    This pr.cedure reads the DATA.DAT file and     *
*                       initializes the program variables passed to    *
*                       it.  Also calls title_slide and                *
*                       bld_stat_line.                                 *
*       global variables used:    blanks, call_routine,                *
*                                 status_line, msg_dir,                *
*                                 decode_dict, printer, trans,         *
*                                 temp, crt, show_abbreviation,        *


FILE: GETDAT.PAS
```

AD-A164 044 DEVELOPMENT OF A COMPUTER AIDED DESIGN PACKAGE FOR CONTROL SYSTEM DESIGN A..(U) AIR FORCE INST OF TECH WRIGHT-PATTERSON AFB OH SCHOOL OF ENGI.. 3/5

UNCLASSIFIED S K MASHIKO ET AL. DEC 85 F/G 9/2 NL


1.0
4.5
5.0
5.6
6.3
2.8
3.2
3.6
4.0
2.5
2.2
2.0
1.1
1.8
1.25
1.4
1.6

```
*                                in_terminal, stat_on,            *
*                                macro_error, help_level,         *
*                                list_dev_name, trans_file_name,  *
*                                macro_file_name                  *
*     global variables changed:  same as global variables used    *
*     global constants used:     term_length, screen_width,       *
*                                printer_length, num_msg_dir,     *
*                                num_ptrs, num_words              *
*     passed variables:          term_dat, print_dat, msg_dir,    *
*                                decode_dict, printer, trans,     *
*                                temp, crt, show_abbreviation,    *
*                                in_terminal, stat_on,            *
*                                macro_error, help_level,         *
*                                list_dev_name, trans_file_name,  *
*                                macro_file_name                  *
*     returned variables:        all passed variables are changed *
*                                except term_dat and print_dat    *
*     files created:             PRINTER.OUT, TRANSACT.ION,       *
*                                TEMP.OUT, MACRO.INP              *
*     files read:                MICROSDW.SYS, HELP.SYS           *
*     procedures called:         clear, title_slide,              *
*                                bld_stat_line                    *
*     called by:      ICECAPPC                                    *
*     author:         vincent m. parisi ii, capt., usaf           *
*     modified by:     Susan K. Mashiko, Capt, USAF               *
*                      Gary C. Tarczynski, Capt, USAF             *
*     mod description:  Modified file assignment statements for   *
*                      the files PRINTER.OUT, TRANSACT.ION,       *
*                      MACRO.INP, and TEMP.OUT.                   *
*
*     mod date:        22 July 85                                 *
*                                                                 *
*******************************************************************)

procedure get_data( var term_dat : term_array;
                    var print_dat :  print_array;
                    var msg_dir : msg_array;
                    var decode_dict : dict_buffer;
                    var printer : boolean;
                    var trans   : boolean;
                    var temp    : boolean;
                    var crt     : boolean;
                    var show_abbreviation : boolean;
                    var in_terminal : boolean;
                    var stat_on     : boolean;
                    var macro_error : boolean;
                    var help_level : byte ;
                    var list_dev_name : paramstring;
                    var trans_file_name : paramstring;


FILE: GETDAT.PAS
```

```
                    var macro_file_name : paramstring);

type    datarecord      = record
                tdata   : data;
                end;
        dataptr         = ^datarecord;

var     data_file       : file of data;
        data_recs       : dataptr;   { use a pointer to a record containing }
                                     { a record so the initialization data  }
                                     { can be disposed of after it is       }
                                     { transfered to global storage areas   }
        i               : integer;
begin
  writeln('Initializing the MICROSDW Menu Structure ',
          'and Hardware configuration');

  assign( data_file, 'MICROSDW.SYS' );
  reset( data_file );

  new(data_recs);
  read( data_file, data_recs^.tdata );
  close( data_file );

  move( data_recs^.tdata.term, term_dat, ( term_length + term_length ));

  blanks := '';
  call_routine := '';

  for i := 1 to screen_width do
   blanks := concat( blanks, ' ' );

  status_line := '';

  stat_on := false;

  title_slide( term_dat );

(* --------------- Transfer the rest of the data to Global Storage areas *)
  for i := 1 to printer_length do
    print_dat[ i ] := data_recs^.tdata.printr[ i ];

  for i := 1 to num_msg_dir do
    begin
      msg_dir[ i ].loc_rec := data_recs^.tdata.msg_dir[ i ].loc_rec;
      msg_dir[ i ].length  := data_recs^.tdata.msg_dir[ i ].length;
    end;

  for i := 1 to num_ptrs do
```

FILE: GETDAT.PAS

```
    begin
      decode_dict.ptrs[ i, 1 ] := data_recs^.tdata.decode_dict.ptrs[ i, 1 ];
      decode_dict.ptrs[ i, 2 ] := data_recs^.tdata.decode_dict.ptrs[ i, 2 ];
      decode_dict.ptrs[ i, 3 ] := data_recs^.tdata.decode_dict.ptrs[ i, 3 ];
    end;

  for i := 0 to num_words do
    begin
      decode_dict.words[ i ]  := data_recs^.tdata.decode_dict.words[ i ];
      decode_dict.abbrev[ i ] := data_recs^.tdata.decode_dict.abbrev[ i ];
    end;

  with data_recs^.tdata do
  begin
    printer           := param[1].bools[1];
    trans             := param[1].bools[2];
    temp              := param[1].bools[3];
    crt               := param[1].bools[4];
    show_abbreviation := param[1].bools[5];
    in_terminal       := param[1].bools[6];
    stat_on           := param[1].bools[7];
    macro_error       := param[1].bools[8];
    help_level        := param[1].ints[1];
    list_dev_name     := param[1].strings[1];
    trans_file_name   := param[1].strings[2];
    macro_file_name   := param[1].strings[3];
  end;

(* dispose of the temporary "data_recs" storage *)
  dispose(data_recs);

(* build the status line to be shown after every pause and clear*)
  bld_stat_line( help_level, temp, printer, trans );

(***************************************************************
*       now open other files used in this system so they are    *
*       ready for use.                                          *
***************************************************************)

(*DELETE***DELETE***DELETE***DELETE***DELETE***DELETE***DELETE***DELETE*
          This section of Moore's original code was commented
          out by Mashiko and Tarczyński due to problems with
          the file assignment statements.

assign( list_dev, list_dev_name );
rewrite( list_dev );

assign( trans_file, trans_file_name );
if trans then rewrite( trans_file );


FILE: GETDAT.PAS
rewrite( temp_file );

assign( macro_file, macro_file_name );
reset( macro_file );

assign( msg_txt, 'help.sys' );
reset( msg_txt );
*DELETE***DELETE***DELETE***DELETE***DELETE***DELETE***DELETE***DELETE*)

(*INSERT***INSERT***INSERT***INSERT***INSERT***INSERT***INSERT***INSERT*
          This section of code was added by Mashiko and
          Tarczynski to solve the file assignment problems.*)

assign( list_dev, 'PRINTER.OUT');
if printer then rewrite( list_dev);

assign( trans_file, 'TRANSACT.ION');
if trans then rewrite( trans_file);

assign( temp_file, 'TEMP.OUT');
if temp then rewrite( temp_file);

assign( macro_file, 'MACRO.INP');
rewrite( macro_file);

assign( msg_txt, 'HELP.SYS');
reset( msg_txt);
(*INSERT***INSERT***INSERT***INSERT***INSERT***INSERT***INSERT***INSERT*)

end;
```

FILE: GETDAT.PAS

```
(****************************************************************************
*****************************************************************************
**                                                                         **
**      file:           GETDAT.PAS      *** IBM ONLY ***                   **
**      procedure contained:  get_data, bld_stat_line,                     **
**                            title_slide                                  **
**      version:        2.0                                                **
**      date:           22 July 85                                         **
**      description:    This file contains the procedures that             **
**                      read the DATA.DAT file, initialize the             **
**                      program variables, initialize and build            **
**                      the status line, and display the title             **
**                      slide.                                             **
**      author:         vincent m. parisi ii, capt., usaf                  **
**                      Susan K. Mashiko, Capt, USAF                       **
**                      Gary C. Tarczynski, Capt, USAF                     **
**                                                                         **
*****************************************************************************
****************************************************************************)

(****************************************************************************
*                                                                           *
*     procedure:      title_slide      *** IBM ONLY ***                     *
*     version:        3.0                                                   *
*     date:           22 July 85                                            *
*     description:    This procedure displays the system title              *
*                     slide.  By this, it demonstrates that at              *
*                     least the terminal control codes have been            *
*                     initialized properly, and probably the                *
*                     rest of the parameters.                               *
*     passed variables:       term_dat                                      *
*     procedures called:      clear, gotoxy,  highlight,                    *
*                             nohighlight, rectangle                        *
*     called by:      get_dat                                               *
*     author:         Gary C. Tarczynski, Capt, USAF                        *
*                     Susan K. Mashiko, Capt, USAF                          *
*                                                                           *
****************************************************************************)

procedure title_slide( var term_dat : term_array );

  begin
    clear;
    gotoxy(2,34);
      write(' WELCOME TO ');
    rectangle(4,19,41,7);

(*---------- begin writing "ICECAP" in big letters ----------*)
    highlight;
    gotoxy(5,21);  write('    ');
    gotoxy(5,26);  write('      ');
    gotoxy(5,33);  write('     ');
    gotoxy(5,39);  write('      ');
    gotoxy(5,46);  write('      ');
    gotoxy(5,53);  write('      ');

    gotoxy(6,22);  write(' ');
    gotoxy(6,26);  write(' ');
    gotoxy(6,30);  write(' ');
    gotoxy(6,33);  write(' ');
    gotoxy(6,39);  write(' ');
    gotoxy(6,43);  write(' ');
    gotoxy(6,46);  write(' ');
    gotoxy(6,50);  write(' ');
    gotoxy(6,53);  write(' ');
    gotoxy(6,57);  write(' ');

    gotoxy(7,22);  write(' ');
    gotoxy(7,26);  write(' ');
    gotoxy(7,33);  write('   ');
    gotoxy(7,39);  write(' ');
    gotoxy(7,46);  write(' ');
    gotoxy(7,50);  write(' ');
    gotoxy(7,53);  write('      ');

    gotoxy(8,22);  write(' ');
    gotoxy(8,26);  write(' ');
    gotoxy(8,30);  write(' ');
    gotoxy(8,33);  write(' ');
    gotoxy(8,39);  write(' ');
    gotoxy(8,43);  write(' ');
    gotoxy(8,46);  write('      ');
    gotoxy(8,53);  write(' ');

    gotoxy(9,21);  write('    ');
    gotoxy(9,26);  write('      ');
    gotoxy(9,33);  write('     ');
    gotoxy(9,39);  write('      ');
    gotoxy(9,46);  write(' ');
    gotoxy(9,50);  write(' ');
    gotoxy(9,53);  write(' ');
    nohighlight;
(*---------- end writing "ICECAP" in big letters ----------*)

    gotoxy(12,11);
      write(' INTERACTIVE CONTROL ENGINEERING COMPUTER ANALYSIS PACKAGE ');
    gotoxy(14,26);
      write(' IBM PC/XT/AT - VERSION 1.0 ');


FILE: GETDAT.PAS    *** IBM ONLY ***
```

```
rectangle(16,4,42,6);
  gotoxy(17,5);
    write(' DEVELOPED AT: ');
  gotoxy(18,5);
    write(' The Air Force Institute of Technology ');
  gotoxy(19,5);
    write(' Electrical Engineering Dept ');
  gotoxy(20,5);
    write(' Wright-Patterson AFB, OH  45433 ');
  gotoxy(22,21);
    highlight;
    write('   >>>> Press <CR> Key to Continue... <<<<   ');
    nohighlight;
    readln;
  gotoxy(5,20);
    write('              COPYRIGHT 1985              ');
  gotoxy(6,20);
    write('                                          ');
  gotoxy(7,20);
    write(' WRITTEN BY:  Capt Susan K. Mashiko    ');
  gotoxy(8,20);
    write('                Capt Gary C. Tarczynski  ');
  gotoxy(9,20);
    write(' MENU DEVELOPED BY: Capt Paul A. Moore ');
  gotoxy(17,5);
    write('For more information on ICECAP, contact:');
  gotoxy(18,5);
    write('     Dr. Gary B. Lamont                  ');
  gotoxy(19,5);
    write('     Electrical Engineering Dept         ');
  gotoxy(20,5);
    write('     Air Force Institute of Technology   ');
end;

(**********************************************************************
*                                                                     *
*      procedure:      bld_stat_line                                  *
*      version:        1.2                                            *
*      date:           18 oct 83                                      *
*      description:    This module builds the status line from        *
*                      initialization data from disk storage.         *
*                      Data is in param group one.                    *
*      global variables used:        status_line, help_level,         *
*                                    temp, printer, trans             *
*      global variables changed:     status_line                      *
*      passed variables:             help_level, temp, printer,       *
*                                    trans                            *
*      called by:                    get_dat                          *
*      author:         vincent m. parisi ii, capt., usaf              *
```

FILE: GETDAT.PAS   *** IBM ONLY ***

```
*                                                                     *
***********************************************************************)

procedure bld_stat_line
                ( help_level : integer; temp : boolean; printer : boolean;
                        trans : boolean );
var     help    :       char;
        on_off  :       string[ 3 ];
begin
  status_line := concat( status_line, '  Help level = ' );
  if help_level = 3 then help := '3'
  else
  if help_level = 2 then help := '2'
  else
  help := '1';
  status_line := concat( status_line, help );

  status_line := concat( status_line, '  Echo Print - ' );
  if printer then on_off := 'ON '
  else
  on_off := 'OFF';
  status_line := concat( status_line, on_off );

  status_line := concat( status_line, '  Transaction copy - ' );
  if trans then on_off := 'ON '
  else
  on_off := 'OFF';
  status_line := concat( status_line, on_off );

  status_line := concat( status_line, '  Temporary - ' );
  if temp then on_off := 'ON '
  else
  on_off := 'OFF';
  status_line := concat( status_line, on_off );
end;

(***********************************************************************
*                                                                     *
*       procedure:      get_data                                      *
*       version:        4.0                                           *
*       date:           22 July 85                                    *
*       description:    This procedure reads the DATA.DAT file and    *
*                       initializes the program variables passed to   *
*                       it.  Also calls title_slide and               *
*                       bld_stat_line.                                *
*       global variables used:      blanks, call_routine,             *
*                                   status_line, msg_dir,             *
*                                   decode_dict, printer, trans,      *
*                                   temp, crt, show_abbreviation,     *
*                               in_terminal, stat_on,              *
*                               macro_error, help_level,           *
*                               list_dev_name, trans_file_name,    *
*                               macro_file_name                    *
*      global variables changed:   same as global variables used   *
*      global constants used:      term_length, screen_width,      *
*                               printer_length, num_msg_dir,       *
*                               num_ptrs, num_words                *
*      passed variables:           term_dat, print_dat, msg_dir,   *
*                               decode_dict, printer, trans,       *
*                               temp, crt, show_abbreviation,      *
*                               in_terminal, stat_on,              *
*                               macro_error, help_level,           *
*                               list_dev_name, trans_file_name,    *
*                               macro_file_name                    *
*      returned variables:         all passed variables are changed *
*                               except term_dat and print_dat      *
*      files created:              PRINTER.OUT, TRANSACT.ION,      *
*                               TEMP.OUT, MACRO.INP                *
*      files read:                 MICROSDW.SYS, HELP.SYS          *
*      procedures called:          clear, title_slide,             *
*                               bld_stat_line                      *
*      called by:      ICECAPPC                                    *
*      author:         vincent m. parisi ii, capt., usaf           *
*      modified by:     Susan K. Mashiko, Capt, USAF               *
*                       Gary C. Tarczynski, Capt, USAF             *
*      mod description:  Modified file assignment statements for   *
*                        the files PRINTER.OUT, TRANSACT.ION,      *
*                        MACRO.INP, and TEMP.OUT.                  *
*                                                                  *
*      mod date:        22 July 85                                 *
*                                                                  *
********************************************************************)

procedure get_data( var term_dat : term_array;
                    var print_dat :  print_array;
                    var msg_dir : msg_array;
                    var decode_dict : dict_buffer;
                    var printer : boolean;
                    var trans   : boolean;
                    var temp    : boolean;
                    var crt     : boolean;
                    var show_abbreviation : boolean;
                    var in_terminal : boolean;
                    var stat_on     : boolean;
                    var macro_error : boolean;
                    var help_level : byte ;
                    var list_dev_name : paramstring;
                    var trans_file_name : paramstring;
```

```
                  var macro_file_name : paramstring);

 type    datarecord      = record
                 tdata   : data;
                 end;
         dataptr         = ^datarecord;

 var     data_file       : file of data;
         data_recs       : dataptr;    { use a pointer to a record containing }
                                       { a record so the initialization data  }
                                       { can be disposed of after it is       }
                                       { transfered to global storage areas   }
         i               : integer;
begin
  writeln('Initializing the MICROSDW Menu Structure ',
          'and Hardware configuration');

  assign( data_file, 'MICROSDW.SYS' );
  reset( data_file );

  new(data_recs);
  read( data_file, data_recs^.tdata );
  close( data_file );

  move( data_recs^.tdata.term, term_dat, ( term_length + term_length ));

  blanks := '';
  call_routine := '';

  for i := 1 to screen_width do
   blanks := concat( blanks, ' ' );

  status_line := '';

  stat_on := false;

  title_slide( term_dat );

(* --------------- Transfer the rest of the data to Global Storage areas *)
  for i := 1 to printer_length do
    print_dat[ i ] := data_recs^.tdata.printr[ i ];

  for i := 1 to num_msg_dir do
    begin
      msg_dir[ i ].loc_rec := data_recs^.tdata.msg_dir[ i ].loc_rec;
      msg_dir[ i ].length  := data_recs^.tdata.msg_dir[ i ].length;
    end;

  for i := 1 to num_ptrs do


FILE: GETDAT.PAS    *** IBM ONLY ***
```

```
    begin
      decode_dict.ptrs[ i, 1 ] := data_recs^.tdata.decode_dict.ptrs[ i, 1 ];
      decode_dict.ptrs[ i, 2 ] := data_recs^.tdata.decode_dict.ptrs[ i, 2 ];
      decode_dict.ptrs[ i, 3 ] := data_recs^.tdata.decode_dict.ptrs[ i, 3 ];
    end;

  for i := 0 to num_words do
    begin
      decode_dict.words[ i ]  := data_recs^.tdata.decode_dict.words[ i ];
      decode_dict.abbrev[ i ] := data_recs^.tdata.decode_dict.abbrev[ i ];
    end;

  with data_recs^.tdata do
  begin
    printer           := param[1].bools[1];
    trans             := param[1].bools[2];
    temp              := param[1].bools[3];
    crt               := param[1].bools[4];
    show_abbreviation := param[1].bools[5];
    in_terminal       := param[1].bools[6];
    stat_on           := param[1].bools[7];
    macro_error       := param[1].bools[8];
    help_level        := param[1].ints[1];
    list_dev_name     := param[1].strings[1];
    trans_file_name   := param[1].strings[2];
    macro_file_name   := param[1].strings[3];
  end;

(* dispose of the temporary "data_recs" storage *)
  dispose(data_recs);

(* build the status line to be shown after every pause and clear*)
  bld_stat_line( help_level, temp, printer, trans );

(****************************************************************
*       now open other files used in this system so they are    *
*       ready for use.                                          *
****************************************************************)

(*DELETE***DELETE***DELETE***DELETE***DELETE***DELETE***DELETE***DELETE*
          This section of Moore's original code was commented
          out by Mashiko and Tarczynski due to problems with
          the file assignment statements.

assign( list_dev, list_dev_name );
rewrite( list_dev );

assign( trans_file, trans_file_name );
if trans then rewrite( trans_file );


FILE: GETDAT.PAS    *** IBM ONLY ***
rewrite( temp_file );

assign( macro_file, macro_file_name );
reset( macro_file );

assign( msg_txt, 'help.sys' );
reset( msg_txt );
*DELETE***DELETE***DELETE***DELETE***DELETE***DELETE***DELETE***DELETE*)

(*INSERT***INSERT***INSERT***INSERT***INSERT***INSERT***INSERT***INSERT*
          This section of code was added by Mashiko and
          Tarczynski to solve the file assignment problems.*)

assign( list_dev, 'PRINTER.OUT');
if printer then rewrite( list_dev);

assign( trans_file, 'TRANSACT.ION');
if trans then rewrite( trans_file);

assign( temp_file, 'TEMP.OUT');
if temp then rewrite( temp_file);

assign( macro_file, 'MACRO.INP');
rewrite( macro_file);

assign( msg_txt, 'HELP.SYS');
reset( msg_txt);
(*INSERT***INSERT***INSERT***INSERT***INSERT***INSERT***INSERT***INSERT*)

end;
```

FILE: GETDAT.PAS   *** IBM ONLY ***

```
(*****************************************************************************
******************************************************************************
**                                                                          **
**      file:               GETINT.PAS                                      **
**      procedures contained:   del_lst_ch                                  **
**                              ck_chr                                      **
**                              out_int                                     **
**                              get_int                                     **
**                              getchi                                      **
**      version:            1.2                                             **
**      date:               18 Oct 83                                       **
**      description:        This file contains procedures that              **
**                          handle I/O for integers.  Since normal          **
**                          program operation does not handle integer       **
**                          error exceptions very well, these               **
**                          routines do the job.                            **
**      author:             vincent m. parisi ii, capt., usaf               **
**                                                                          **
******************************************************************************
*****************************************************************************)

(*****************************************************************************
*                                                                            *
*      function:           getchi                                            *
*      version:            1.0                                               *
*      date:               18 oct 83                                         *
*      description:        This procedure gets one character from a          *
*                          string and returns it to the read function        *
*                          for conversion.  Routine taken from the           *
*                          Pascal MT+ instruction manual, section on         *
*                          redirected I/O.                                   *
*      global variables used:          strng                                 *
*      global variables changed:       strng                                 *
*      returned variables:             getchi                                *
*      called by:                      get_int, get_real                     *
*      author:             vincent m. parisi ii, capt., usaf                 *
*                                                                            *
*****************************************************************************)

function getchi : char;
  begin
    if length( strng ) > 0 then
      begin
        getchi := strng[ 1 ];
        delete( strng, 1, 1 );
      end
    else
      getchi := ' ';
  end;


FILE: GETINT.PAS
```

```
(****************************************************************
*                                                               *
*       procedure:      del_lst_ch                              *
*       version:        1.0                                     *
*       date:           18 oct 83                               *
*       description:    This procedure deletes the last character *
*                       from the CRT.                           *
*       global constants used:          backspace               *
*       called by:                      ck_chr                  *
*       author:         vincent m. parisi ii, capt., usaf       *
*                                                               *
****************************************************************)

procedure del_lst_ch;

  begin
    write( chr( backspace ) );
    write( ' ' );
    write( chr( backspace ) );
  end;

(****************************************************************
*                                                               *
*       procedure:      ck_chr                                  *
*       version:        1.2                                     *
*       date:           18 oct 83                               *
*       description:    This procedure checks each character input *
*                       to see if it is a delete or a backspace, *
*                       If it is, the screen is updated appropriately*
*                       and the destination string is changed.  *
*       global variables used:          strng                   *
*       global variables changed:       strng                   *
*       global constants used:          del, backspace          *
*       passed variables:               ch, strng               *
*       returned variables:             strng                   *
*       procedures called:              del_lst_ch              *
*       called by:                      get_int                 *
*       author:         vincent m. parisi ii, capt., usaf       *
*                                                               *
****************************************************************)

procedure ck_chr( ch : char; var strng : msg_line );

  begin
    if ((( ord( ch ) = del ) or ( ord( ch ) = backspace )) and ( length( strng
)
 > 0 )) then
      delete( strng, length( strng ), 1 );


FILE: GETINT.PAS
```

```
    if ord( ch ) = del then
      del_lst_ch;
  end;

(*******************************************************************
*                                                                 *
*       procedure:      out_int                                   *
*       version:        1.2                                       *
*       date:           18 oct 83                                 *
*       description:    This procedure directs the output of      *
*                       integers.                                 *
*       global variables used:  crt, trans, printer, temp,        *
*                               temp_file, trans_file, list_dev   *
*       global variables changed:  temp_file, trans_file, list_dev *
*       passed variables:       number, field, dest               *
*       files written:          TEMP.OUT, TRANSACT.ION, PRINTER.OUT *
*       called by:      make_pretty                               *
*       author:         vincent m. parisi ii, capt., usaf         *
*                                                                 *
*******************************************************************)

procedure out_int( number : integer; field : integer; dest : char );

begin

  case dest of
        'C', 'c'        :       write( number:field );
        'P', 'p'        :       writeln( number:field );
        'B', 'b'        :       begin
                                  write( number:field );
                                  writeln( number:field );
                                end;
        'A', 'a'        :       begin
                                  if crt then write( number:field );
                                  if trans then
                                        writeln( trans_file, number:field );
                                  if printer then
                                        writeln( list_dev, number:field );
                                  if temp then
                                        writeln( temp_file, number:field );
                                end;
  end;
end;

(*******************************************************************
*                                                                 *
*       procedure:      get_int                                   *
*       version:        1.3                                       *
*       date:           18 oct 83                                 *


FILE: GETINT.PAS
*       description:    This procedure handles the input of integers.*
*                       Normal program integer input does not have   *
*                       edit capability to exclude inputs such as    *
*                       letters for integers.  It just displays an   *
*                       error message and asks for the number again. *
*                       This procedure does not accept anything      *
*                       but valid integer constructs.                *
*       global variables used:  strng, abort_command                 *
*       global variables changed: strng, abort_command               *
*       globa' constants used:  as_assigned                          *
*       passed variables:       number, abort_command                *
*       returned variables:     number, abort_command                *
*       procedure called:       get_strng                            *
*       called by:              get_tf                               *
*       author:         vincent m. parisi ii, capt., usaf            *
*                                                                    *
**********************************************************************)

(* forward reference to get_strng   *)
procedure get_strng(var strng : msg_line; var abort_command : boolean;
                        in_dev : char; chr1, chr2 : char);  forward;

procedure get_int( var number : integer; var abort_command : boolean );

var    ch   : char;
       result : integer;

begin

  number := 0;
  get_strng( strng, abort_command, as_assigned, '0', '9' );

  (* Val converts a string to a number, result = 0 if no errors, else *)
  (* result is the position of the invalid character in the string    *)
  if not abort_command then
     Val(strng,number,result);

end;
```

FILE: GETINT.PAS

```
(*****************************************************************
******************************************************************
**                                                              **
**      file:                    GETLINE.PAS                    **
**      procedure contained:     get_line                       **
**      version:                 3.1                            **
**      date:                    27 Sept 1984                   **
**      description:    This module contains the procedure that **
**                      builds a decoded entry from the record  **
**                      pointed to on entry.                    **
**      author:         vincent m. parisi ii, capt., usaf       **
**                                                              **
******************************************************************
*****************************************************************)

(*****************************************************************
*                                                                *
*      procedure:      get_line                                  *
*      version:        3.0                                       *
*      date:           17 july 1983                              *
*      description:    This procedure builds a decoded entry     *
*                      from the record pointed to on entry.      *
*                      The pointers come from the ptrs part      *
*                      of dict_buffer and the word comes from    *
*                      the words part of dict_buffer which is    *
*                      pointed to by the first pointer of ptrs.  *
*      global variables used:  blanks                            *
*      global constants used:  wordsize, screen_width,           *
*                              buffersize, word_length           *
*      passed variables:       decode, rec_num                   *
*      returned variables:     decode                            *
*      called by:              get_cmd                           *
*                              val_n_dec                         *
*      author:         vincent m. parisi ii, capt., usaf         *
*                                                                *
*****************************************************************)

procedure get_line( var decode : dictionary; rec_num : integer );

var dlen : integer;

begin
  decode.dictword := decode_dict.words[ decode_dict.ptrs[ rec_num, 1 ] ];
  decode.abbrev   := decode_dict.abbrev[decode_dict.ptrs[ rec_num, 1 ] ];
  decode.matchp   := decode_dict.ptrs[ rec_num, 2 ];
  decode.nomatchp := decode_dict.ptrs[ rec_num, 3 ];

  (* blank pad "decode.dictword" *)
  dlen            := length(decode.dictword);


FILE: GETLINE.PAS
```

```
  Insert(blanks,decode.dictword,dlen+1);
end;
```

```
(*****************************************************************
******************************************************************
**                                                              **
**   file:                  GETMAT.PAS                          **
**   procedures contained:  make_pretty_large_matrix_one,       **
**                          make_pretty_large_matrix_two,       **
**                          make_pretty_small_matrix,           **
**                          left_bracket, right_bracket, get_mat **
**                          get_matrix_entries                  **
**   version:               1.0                                 **
**   date:                  12 Sep 85                           **
**   description:  The procedures contained in this file will get a **
**                 matrix and store it in its proper location.  **
**   author:       Susan K. Mashiko, Capt, USAF                 **
**                 Gary C. Tarczynski, Capt, USAF               **
**                                                              **
******************************************************************
*****************************************************************)

(****************************************************************
*                                                               *
*      procedure:      left_bracket                             *
*      version:        1.0                                      *
*      date:           11 September 1985                        *
*      description:    This procedure draws a left bracket      *
*                      around a matrix displayed on the terminal. *
*      global variables used:    term                           *
*      passed variables:         num_rows                       *
*      procedures called:        graphics, gotoxy, nographics   *
*      called by:      make_pretty_small_matrix,                *
*                      make_pretty_large_matrix_one,            *
*                      make_pretty_large_matrix_two             *
*      author:         Gary C. Tarczynski, Capt, USAF           *
*                      Susan K. Mashiko, Capt, USAF             *
*                                                               *
****************************************************************)

procedure left_bracket( var num_rows : integer );

var
  column_length     :   integer;
  i                 :   integer;

begin

  column_length := 5 + num_rows;
  graphics;

  gotoxy(5,7);                        (* draw upper left corner *)


FILE: GETMAT.PAS
```

```
  write( chr( term[64] ));

  for i := 6 to column_length do                 (* draw column *)
    begin
      gotoxy(i,7);
      write( chr( term[54] ));
    end;

  gotoxy((column_length + 1), 7);     (* draw lower left corner *)
  write( chr( term[63] ));

  nographics;

end;

(*******************************************************************
*                                                                  *
*      procedure:      right_bracket                               *
*      version:        1.0                                         *
*      date:           11 September 1985                           *
*      description:    This procedure draws a right bracket        *
*                      around a matrix displayed on the terminal.  *
*      global variables used:    term                              *
*      passed variables:         num_rows, num_cols                *
*      procedures called:        graphics, gotoxy, nographics      *
*      called by:      make_pretty_small_matrix,                   *
*                      make_pretty_large_matrix_two                *
*      author:         Gary C. Tarczynski, Capt, USAF              *
*                      Susan K. Mashiko, Capt, USAF                *
*                                                                  *
*******************************************************************)

procedure right_bracket( var num_rows, num_cols : integer );

var
  column_location     :   integer;
  column_length       :   integer;
  i                   :   integer;

begin

  column_location := 8 + ( num_cols * 13 ) + 2;
  column_length := 5 + num_rows;
  if num_cols >= 6 then
    column_location := column_location - 65;
  graphics;

  gotoxy(5,column_location);           (* draw upper right corner *)
  write( chr( term[61] ));


FILE: GETMAT.PAS
```

```
  for i := 6 to column_length do                      (* draw column *)
    begin
      gotoxy(i,column_location);
      write( chr( term[54] ));
    end;

  gotoxy(( column_length + 1 ), column_location);
  write( chr( term[62] ));                (* draw lower right corner *)

  nographics;

end;

(***********************************************************************
*                                                                      *
*    procedure:    make_pretty_large_matrix_one                        *
*    version:      1.0                                                 *
*    date:         11 September 85                                     *
*    description:  This procedure will draw the left bracket and place*
*                  row and col numbers on the first display screen of *
*                  a matrix with more than 5 col.                      *
*    global constants used:    crt_only,    as_assigned                *
*    passed variables:         num_row,     num_col                    *
*    procedures called:        gotoxy,      out_string,                *
*                              out_int,     left_bracket               *
*    called by:  get_mat                                               *
*    author:   Susan K. Mashiko, Capt, USAF                            *
*              Gary C. Tarczynski, Capt, USAF                          *
*                                                                      *
***********************************************************************)

procedure make_pretty_large_matrix_one( var num_row : integer;
                                        var num_col : integer);

var
  i     : integer;
  row   : integer;
  col   : integer;

begin
  row := 5;

  (* put up the row numbers and draw the left bracket *)
  for i := 1 to num_row do
    begin
      gotoxy(( row + i ), 2 );
      out_string( 'ROW', as_assigned );
      gotoxy(( row + i ), 5 );
      out_int( i, 2, crt_only );


FILE: GETMAT.PAS
```

```
    end;
  left_bracket( num_row );

  (* put up the column numbers *)
  col := 14;
  for i := 0 to 4 do
    begin
      gotoxy( 4, ( col + (i * 13)));
      out_string( 'COL', as_assigned );
      gotoxy( 4, ( col + (i * 13) + 3 ));
      out_int( (i + 1 ), 2, crt_only )
    end;
end;

(*****************************************************************
*                                                                *
*   procedure:    make_pretty_large_matrix_two                   *
*   version:      1.0                                            *
*   date:         11 September 85                                *
*   description:  This procedure will draw the right bracket of a *
*                 matrix with more than 5 columns. It will also write*
*                 the col and row identifiers on the screen.     *
*   global constants used:     crt_only,      as_assigned        *
*   passed variables:          num_row,       num_col            *
*   procedures called:         gotoxy,        out_string,        *
*                              out_int,       right_bracket      *
*   called by:   get_matrix_entries                              *
*   author:   Susan K. Mashiko, Capt, USAF                       *
*             Gary C. Tarczynski, Capt, USAF                     *
*                                                                *
*****************************************************************)

procedure make_pretty_large_matrix_two(var num_row : integer;
                                       var num_col : integer);

var
  i     : integer;
  row   : integer;
  col   : integer;

begin
  row := 5;

  (* put up the row numbers *)
  for i := 1 to num_row do
    begin
      gotoxy(( row + i ), 2 );
      out_string( 'ROW', as_assigned );
      gotoxy(( row + i ), 5 );
```

FILE: GETMAT.PAS

```
      out_int( i, 2, crt_only );
    end;

  (* put up the column numbers *)
  col := 14;
  for i := 0 to ( num_col - 6 ) do
    begin
      gotoxy( 4, ( col + (i * 13)));
      out_string( 'COL', as_assigned );
      gotoxy( 4, ( col + (i * 13) + 3 ));
      out_int(( i + 6 ), 2, crt_only )
    end;

  (* draw the right bracket *)
  right_bracket( num_row, num_col );
end;

(**********************************************************************
*                                                                     *
*    procedure:    get_matrix_entries                                 *
*    version:      1.0                                                *
*    date:         11 September 85                                    *
*    description:  This procedure will get a matrix entry             *
*    global variables used:    abort_command                          *
*    passed variables:         matrix, abort_command                  *
*    returned variables:       matrix                                 *
*    procedures called:        get_r_num,   pause,                    *
*                              clear,                                 *
*                              make_pretty_large_matrix_two           *
*    called by:  get_mat                                              *
*    author:    Susan K. Mashiko, Capt, USAF                          *
*               Gary C. Tarczynski, Capt, USAF                        *
*                                                                     *
**********************************************************************)

procedure get_matrix_entries( var matrix : matrix;
                              var abort_command : boolean );

var
  i      : integer;
  j      : integer;
  number : real;
  row    : integer;
  col    : integer;
  num_row : integer;
  num_col : integer;
  col_element : integer;


FILE: GETMAT.PAS
```

```
begin
  (* get the matrix entries *)
  row := 5;
  col := 10;
  num_row := matrix.num_rows;
  num_col := matrix.num_cols;

  (* i is the counter for rows and j is the counter for cols *)
  if num_col <= 5 then
    begin
      for j := 0 to ( num_col - 1 ) do
        begin
          col_element := j + 1;
          for i := 1 to num_row do
            begin
              get_r_num( number, (row + i), (col + (j * 13 )), abort_command );
              if abort_command then exit;
              matrix.element[ i , col_element ] := number;
            end;
        end;
    end
  else
    begin
      for j := 0 to 4 do
        begin
          col_element := j + 1;
          for i := 1 to num_row do
            begin
              get_r_num( number, (row + i), (col + (j * 13 )), abort_command );
              if abort_command then exit;
              matrix.element[ i , col_element ] := number;
            end;
        end;

      pause;
      clear;
      make_pretty_large_matrix_two( num_row, num_col );

      for j := 0 to num_col - 6 do
        begin
          col_element := j + 6;
          for i := 1 to num_row do
            begin
              get_r_num( number, (row + i), (col + (j * 13 )), abort_command );
              if abort_command then exit;
              matrix.element[ i , col_element ] := number;
            end;
        end;
   end;
```

FILE: GETMAT.PAS

```
end;
(*********************************************************************
*                                                                    *
*   procedure:     make_pretty_small_matrix                          *
*   version:       1.0                                               *
*   date:          11 September 85                                   *
*   description:   This procedure will draw the brackets and label the*
*                  rows and columns for a matrix with less than 5 col.*
*   global variables used:    none                                   *
*   global variables changed: none                                   *
*   global constants used:    crt_only,   as_assigned                *
*   passed variables:         num_row,    num_col                    *
*   procedures called:        gotoxy,     out_string,                *
*                             out_int,    left_bracket,              *
*                             right_bracket                          *
*   called by:  get_mat                                              *
*   author:   Susan K. Mashiko, Capt, USAF                           *
*             Gary C. Tarczynski, Capt, USAF                         *
*                                                                    *
*********************************************************************)

procedure make_pretty_small_matrix(var num_row : integer;
                                   var num_col : integer );

var
  i     : integer;
  row   : integer;
  col   : integer;

begin
  row := 5;

  (* put up the row numbers and draw the left bracket *)
  for i := 1 to num_row do
    begin
      gotoxy(( row + i ), 2 );
      out_string( 'ROW', as_assigned );
      gotoxy(( row + i ), 5 );
      out_int( i, 2, crt_only );
    end;
  left_bracket( num_row );

  (* put up the column numbers *)
  col := 14;
  for i := 0 to ( num_col - 1 )do
    begin
      gotoxy( 4, ( col + (i * 13)));
      out_string( 'COL', as_assigned );


FILE: GETMAT.PAS
```

```
      gotoxy( 4, ( col + (i * 13) + 3 ));
      out_int( (i + 1), 2, crt_only )
    end;

  (* draw the right bracket *)
  right_bracket( num_row, num_col );
end;

(*********************************************************************
*                                                                    *
*    procedure:    get_mat                                           *
*    version:      1.0                                               *
*    date:         11 September 85                                   *
*    description:  This procedure will get a matrix and store it in  *
*                  its proper location.                              *
*    global variables used:    abort_command                         *
*    global constants used:    crt_only,    max_rows,                *
*                              as_assigned, max_cols                 *
*    passed variables:         def_obj                               *
*    files written:            MATRIX.DAT                            *
*    procedures called:  clear,    out_string,    pause,             *
*                        gotoxy,   get_int,       get_matrix_entries, *
*                        disp_msg, clear_msg,                        *
*                        make_pretty_large_matrix_one,               *
*                        make_pretty_small_matrix                    *
*    called by:                                                      *
*    author:   Susan K. Mashiko, Capt, USAF                          *
*              Gary C. Tarczynski, Capt, USAF                        *
*                                                                    *
*********************************************************************)

procedure get_mat( var def_obj : cmdword );

var
  i          : integer;
  number     : real;
  num_row    : short_int;
  num_col    : short_int;
  matrices : file of matrix;
  mats       : matrix;
  stor_loc : integer;

begin
  abort_command := false;
  clear;
  gotoxy( 10, 5 );
  disp_msg( 41 );

  (* get the number of rows of the matrix *)


FILE: GETMAT.PAS
```

```
repeat
  begin
    gotoxy( 10, 50 );
    out_string( '          ', crt_only );
    gotoxy( 10, 50 );
    get_int( num_row, abort_command );
    if abort_command then exit;
    if (( num_row > max_rows ) or ( num_row < 0 )) then
      begin
        gotoxy( 12, 5 );
        disp_msg( 40 );
      end;
  end;
until (( num_row > 0 ) and ( num_row <= max_rows ));

clear_msg( 40 );

(* get the number of columns of the matrix *)
repeat
  begin
    gotoxy( 12, 5 );
    disp_msg( 42 );
    gotoxy( 12, 50 );
    out_string( '          ', crt_only );
    gotoxy( 12, 50 );
    get_int( num_col, abort_command );
    if abort_command then exit;
    if (( num_col > max_cols ) or ( num_col < 0 )) then
      begin
        gotoxy( 14, 5 );
        disp_msg( 40 );
      end;
  end;
until (( num_col > 0 ) and ( num_col <= max_cols ));

clear;

(* display the title on the screen *)
gotoxy( 1, 33 );
disp_msg( 43 );
gotoxy( 2, 37 );
out_string( def_obj, as_assigned );
mats.num_rows := num_row;
mats.num_cols := num_col;

(* if the matrix is small then get the entries *)
(* small is less than 5 columns                 *)
if num_col <= 5 then
  begin
```

FILE: GETMAT.PAS

```
        make_pretty_small_matrix( num_row, num_col );
        get_matrix_entries( mats, abort_command );
         if abort_command then exit;
      end
    else
    (* if the matrix is large then get the entries *)
    if num_col > 5 then
      begin
        make_pretty_large_matrix_one( num_row, num_col );
        get_matrix_entries( mats, abort_command );
         if abort_command then exit;
      end;

    (* find the storage location for the matrix *)
    if def_obj = 'MATA' then stor_loc := 0
    else
    if def_obj = 'MATB' then stor_loc := 1
    else
    if def_obj = 'MATC' then stor_loc := 2
    else
    if def_obj = 'MATD' then stor_loc := 3
    else
    if def_obj = 'MATE' then stor_loc := 4;

    assign( matrices, 'matrix.dat' );
    reset( matrices );
    seek( matrices, stor_loc );
    write( matrices, mats );

    close( matrices );
    pause;

  end;
```

FILE: GETMAT.PAS

```
(*****************************************************************
******************************************************************
**                                                              **
**      file:                   GETSTRIN.PAS                    **
**      procedure contained:    get_strng                       **
**      version:                2.0                             **
**      date:                   28 august 1983                  **
**      description:    This module contains the procedure that **
**                      gets ASCII input from terminal keyboard **
**                      or macro command file as specified in   **
**                      the input parameter.  Collects charac-  **
**                      ters until a <CR> is entered.           **
**      author:         vincent m. parisi ii, capt., usaf       **
**                                                              **
******************************************************************
*****************************************************************)

(*****************************************************************
*                                                                *
*      procedure:      get_strng                                 *
*      version:        2.0                                       *
*      date:           28 august 1983                            *
*      description:    Gets ascii input from terminal keyboard   *
*                      or macro command file as specified in     *
*                      the input parameter.  Collects charac-    *
*                      ters until a <CR> is entered.             *
*      global variables used:  in_terminal, macro_file, strng,   *
*                              abort_command                     *
*      global variables changed:  strng, abort_command           *
*      global constants used:  screen_width, abort_str           *
*      passed variables:       strng, abort_command, in_dev,     *
*                              chr1, chr2                        *
*      returned variables:     strng, abort_command              *
*      files read:             MACRO.INP                         *
*      called by:      readcom                                   *
*      author:         vincent m. parisi ii, capt., usaf         *
*                                                                *
*****************************************************************)

procedure get_strng;

(*       arguments are specified in an earlier "forward" reference
  ( var strng : msg_line; var abort_command : boolean;
                     in_dev : char; chr1, chr2 : char );
*)

begin
  strng := '';                  (* clear the string *)
  abort_command := false;


FILE: GETSTRIN.PAS
```

```
          case in_dev of
            'A','a' : if in_terminal then
                         begin
                           BufLen := screen_width;
                           read( strng);
                         end
                      else
                         read( macro_file, strng );
            'M','m' : read( macro_file, strng );
            'T','t' : begin
                        BufLen := screen_width;
                        read( strng );
                      end
            else
              begin
                BufLen := screen_width;
                read( strng );
              end;
          end;    (* end case *)

          if (length(strng) = 1) and (strng[1] = abort_str) then
            abort_command := true;

    end;
```

FILE: GETSTRIN.PAS

```
(***************************************************************
****************************************************************
**                                                            **
**    file:          GETTF.PAS                                **
**    procedure contained:    get_r_num,    make_pretty       **
**                            get_fact,     form_poly,        **
**                            disp_poly,    roots,            **
**                            disp_fact,    get_unfact,       **
**                            poly,         get_tf            **
**    version:       8.0                                      **
**    date:          25 September 1985                        **
**    description:   This file contains the procedures that input **
**                   transfer functions in either factored or poly- **
**                   nomial form.                             **
**    author:        vincent m. parisi ii, capt., usaf        **
**                   Susan K. Mashiko, Capt, USAF             **
**                   Gary C. Tarczynski, Capt, USAF           **
**                                                            **
****************************************************************
***************************************************************)

(***************************************************************
*                                                              *
*    procedure:    get_r_num                                   *
*    version:      1.2                                         *
*    date:         20 August 1985                              *
*    description:  This procedure is entered with the location *
*                  of where the real number is positioned, however *
*                  the actual input is at the bottom of the screen *
*                  which allows for various real number input  *
*                  formats on input (ie. exponential, decimal etc) *
*                  once the number is entered, it is converted *
*                  to exponential notation and displayed at the *
*                  proper place.                               *
*    global variables used:      blanks, abort_command         *
*    global variables changed:   blanks                        *
*    global constants used:      crt_only, as_assigned         *
*    passed variables:           number, row, col, abort_command *
*    procedures called:  gotoxy,   highlight,                  *
*                        nohighlight, out_string,              *
*                        get_real, out_real                    *
*    called by:          get_fact                              *
*    author:     vincent m. parisi ii, capt., usaf             *
*    modified by:   Susan K. Mashiko, Capt, USAF               *
*                   Gary C. Tarczynski, Capt, USAF             *
*    mod description:  changed the highlighted area for number is... *
*    mod date:      20 August 85                               *
*                                                              *
***************************************************************)
```

FILE: GETTF.PAS

```
procedure get_r_num( var number : real; row : integer; col : integer;
                     var abort_command : boolean );

  begin
      gotoxy( row, col );
      highlight;
      out_string( copy( blanks, 1, 12), crt_only );
      nohighlight;
      gotoxy( 20, 0 );
      out_string( blanks, crt_only );
      gotoxy( 20,10 );
      highlight;
      out_string( 'Your number...', as_assigned );
      nohighlight;
      get_real( number, abort_command );
      if abort_command then exit;
      gotoxy( row, col );
      out_real( number, 12, as_assigned );
  end;

(**********************************************************************
*                                                                     *
*     procedure:       make_pretty                                    *
*     version:         2.3                                            *
*     date:            26 Aug 85                                      *
*     description:     This procedure pretties up the screen for      *
*                      transfer function input.                       *
*     global variables used:      term, degree                        *
*     global constants used:      crt_only, screen_width,             *
*                                 as_assigned                         *
*     passed variables:           row, degree                         *
*     procedures called:          gotoxy,  disp_msg,                  *
*                                 graphics,  out_string,              *
*                                 nographics,  out_int,               *
*     called by:    get_fact,   get_unfact                            *
*     author:       vincent m. parisi ii, capt., usaf                 *
*     modified by:  Susan K. Mashiko, Capt, USAF                      *
*                   Gary C. Tarczynski, Capt, USAF                    *
*     mod description:  Changed the code to prevent over writing      *
*     mod date:     26 Aug 85                                         *
*                                                                     *
**********************************************************************)

procedure make_pretty( var row : integer; degree : integer );

var  i : integer;

begin


FILE: GETTF.PAS
```

```
(* put up the titles and coefficient words *)
  gotoxy( ( row + 1 ), 0 );
  disp_msg( 14 );

  graphics;

(* put up vertical line to divide screen at column 38 *)
  i := row + 1;
  repeat
    begin
      gotoxy( i, 38 );
      out_string( chr( term[ 54 ] ), crt_only );
      i := i + 1;
    end;
  until i = 20;

(* put up a horizontal line at row = entry row *)
  for i := 0 to screen_width do
    begin
      gotoxy( row, i );
      out_string( chr( term[ 55 ] ), crt_only );
    end;

(* Now put up the "T" at the intersection *)
 gotoxy( row, 38 );
 out_string( chr( term[ 60 ] ), crt_only );

 nographics;

(* put up the numbers to represent the roots to get and the degree
   of the polynomial coefficient *)

  for i := 1 to degree do
    begin
      gotoxy( ( row + 3 + i ), 40 );
      out_int( i, 2, crt_only );
    end;

(* put up "j's" in the root section *)
  for i := 1 to degree do
    begin
      gotoxy( ( row + i + 3 ), 57 );
      out_string( 'j', as_assigned );
    end;

(* put up the powers of the coefficients in the coefficient secion *)
  for i := 0 to degree do
    begin
      gotoxy( ( row + 4 + i ), 24 );


FILE: GETTF.PAS
```

```
      out_string( 'S**', crt_only);
      out_int( ( degree - i ), 2, crt_only );
    end;
end;

(**********************************************************************
*                                                                     *
*    procedure:  ,    get_fact                                        *
*    version:         1.2                                             *
*    date :           4 november 83                                   *
*    description:     This procedure gets the factored form of the    *
*                     polynomial.                                     *
*    global variables used:  abort_command                            *
*    global constants used:  as_assigned                              *
*    passed variables:       poly, row, abort_command                 *
*    returned variables:     poly                                     *
*    procedures called:      make_pretty,   get_r_number,             *
*                            gotoxy,        out_real,                 *
*                            disp_msg,      pause,                    *
*                            clear_msg                                *
*    called by:       poly                                            *
*    author:          vincent m. parisi ii, capt., usaf               *
*    mod description: Changed the order of conjugate storage          *
*    modified by:     Susan K. Mashiko, Capt, USAF                    *
*                     Gary C. Tarczynski, Capt, USAF                  *
*    mod date:        8 Sep 85                                        *
*                                                                     *
**********************************************************************)

procedure get_fact( var poly : polynomial; var row : integer;
                    var abort_command : boolean );

label  repeat1;

var  i      : integer;
     number : real;

begin
  make_pretty( row, poly.polydeg );
  i := 1;

 (* get the term's coefficient, display it and save it        *)
 (* if the coefficent is zero display message and get another *)
  repeat1:
  get_r_num( number, ( row + 2 ), 57, abort_command );
  if abort_command then exit;
  if number = 0 then
    begin


FILE: GETTF.PAS
```

```
      gotoxy( 20, 0 );
      disp_msg( 47 );
      pause;
      gotoxy( 20, 0 );
      clear_msg( 47 );
      goto repeat1;
    end;
  gotoxy( ( row + 2 ), 19 );
  out_real( number, 12, as_assigned );
  poly.coefficient := number;

  while i <= poly.polydeg do
    begin

     (* get the real portion of the pole or zero for this root *)

      get_r_num( number, ( row + 3 + i ), 43, abort_command );
      if abort_command then exit;
      poly.polyfact[ i ].realpart := number;

     (* get the imaginary portion of the pole or zero for this root *)

      get_r_num( number, ( row + 3 + i ), 59, abort_command );
      if abort_command then exit;
      poly.polyfact[ i ].imagpart := number;

     (* if the root is complex, generate its conjugate and show it   *)
     (* always put the negative imaginary part first in the list with*)
     (* its positive conjugate second.  if the imag part is <> 0     *)
     (* and this is the last position in the array, issue an error   *)
     (* message  and get the real part again.                        *)

      if (( number < -0.000001 ) or ( number > 0.000001 )) then
        begin
          if i = poly.polydeg then
            begin
              gotoxy( 20, 5 );
              disp_msg( 10 );
              pause;
              gotoxy( 20, 0 );
              clear_msg( 10 );
              i := i - 1;
            end
          else
            begin
              poly.polyfact[ i + 1 ].realpart := poly.polyfact[ i ].realpart;
              gotoxy( ( row + i + 4 ), 43 );
              out_real( poly.polyfact[ i ].realpart, 12, as_assigned );
              gotoxy( ( row + i + 3 ), 59 );
```

FILE: GETTF.PAS

```
               if number < 0.0 then
                  begin
                    poly.polyfact[ i ].imagpart := number;
                    out_real( number, 12, as_assigned );
                    poly.polyfact[ i + 1 ].imagpart := ( number * (-1.0) );
                  end
               else
                  begin
                    poly.polyfact[ i ].imagpart := ( number * (-1.0 ));
                    out_real( poly.polyfact[ i ].imagpart, 12, as_assigned );
                    poly.polyfact[ i + 1 ].imagpart := number;
                  end;
               i := i + 1;
               gotoxy( ( row + i + 3 ), 59 );
               out_real( poly.polyfact[ i ].imagpart, 12, as_assigned );
             end;
          end;
       i := i + 1;
   end;  (* while *)
end;     (* end of procedure *)

(************************************************************************
*                                                                       *
*    procedure:  form_poly                                              *
*    version:    1.0                                                    *
*    date:       26 Aug 85                                              *
*    description: This procedure forms the polynomial from the          *
*                 factors.                                              *
*    global constants used:   maxdeg1                                   *
*    passed variables:        poly                                      *
*    returned variables:      poly                                      *
*    called by:               poly                                      *
*    author:    Susan K. Mashiko, Capt, USAF                            *
*               Gary C. Tarczynski, Capt, USAF                          *
*                                                                       *
************************************************************************)

procedure form_poly( var poly : polynomial );

var
   real_coeff       :  array[1..maxdeg1] of real;
   imag_coeff       :  array[1..maxdeg1] of real;
   i, j, k          :  integar;
   number_of_roots  :  integer;
   number_of_coeff  :  integer;

begin
   number_of_roots := poly.polydeg;
   number_of_coeff := number_of_roots + 1;


FILE: GETTF.PAS
```

```
   for i := 2 to number_of_coeff do
      begin
         real_coeff[ i ] := 0.0;
         imag_coeff[ i ] := 0.0;
      end;

    real_coeff[ 1 ] := 1.0;
    imag_coeff[ 1 ] := 0.0;
    for i := 1 to number_of_roots do
       begin
          k := i + 1;
          for j := 1 to i do
            begin
              real_coeff[ k ] := -real_coeff[k-1] * poly.polyfact[i].realpart
                                 +imag_coeff[k-1] * poly.polyfact[i].imagpart
                                 +real_coeff[k];
              imag_coeff[ k ] := -imag_coeff[k-1] * poly.polyfact[i].realpart
                                 -real_coeff[k-1] * poly.polyfact[i].imagpart
                                 +imag_coeff[k];
              k := k - 1;
            end;
       end;
       for i := 1 to number_of_coeff do
         begin
           poly.polypoly[i] := real_coeff[i];
         end;
end;
(************************************************************************
*                                                                       *
*     procedure:     get_unfact                                         *
*     version:       2.0                                                *
*     date:          25 September 85                                    *
*     description:   This procedure gets the polynomial form of the     *
*                    polynomial of interest.                            *
*     global variables used:    abort_command                           *
*     global constants used:    as_assigned                             *
*     passed variables:         poly, row, abort_command                *
*     returned variables:       poly                                    *
*     procedures called:        make_pretty, get_r_num, gotoxy,         *
*                               out_real, disp_msg, pause, clear_msg    *
*     called by:                poly                                    *
*     author:        Susan K. Mashiko, Capt, USAF                       *
*                    Gary C. Tarczynski, Capt, USAF                     *
*     modified by:   author                                             *
*     mod description: Corrected the gain handling procedures           *
*     mod date:      25 Sep 85                                          *
*                                                                       *
************************************************************************)


FILE: GETTF.PAS
```

```
procedure get_unfact( var poly : polynomial; row : integer;
                      var abort_command : boolean );

label   repeat1,
        repeat2;

var  i      : integer;
     number : real;

begin
   make_pretty( row, poly.polydeg );
   i := 1;

   (* get the term's coefficent, display it and save it *)
   repeat1:
   get_r_num( number, ( row + 2 ), 19, abort_command );
   if abort_command then exit;
   if number = 0 then
     begin
       gotoxy( 20 ,0 );
       disp_msg( 47 );
       pause;
       gotoxy( 20 ,0 );
       clear_msg( 47 );
       goto repeat1;
     end;
   gotoxy( ( row + 2 ), 57 );
   out_real( number, 12, as_assigned );
   poly.coefficient := number;

   repeat2:
   while i <= ( poly.polydeg + 1 ) do
      begin

         (* get the coefficients for the polynomial, *)
         (* display them and save them              *)
         get_r_num( number, (row + 3 + i), 7, abort_command);
         if abort_command then exit;
         poly.polypoly[ i ] := number;

         i := i + 1;
      end;    (* end while     *)

   (* the leading coefficent of the polynomial cannot be zero *)
   if poly.polypoly[ 1 ] = 0 then
     begin
       gotoxy( 20 ,0 );
       disp_msg( 62 );
       pause;


FILE: GETTF.PAS
```

```
      gotoxy( 20 ,0 );
      clear_msg( 62 );
      i := 1;
      goto repeat2;
    end;

  (* the poly gain is the input coefficient * leading poly coefficient *)
  poly.coefficient := poly.coefficient * poly.polypoly[ 1 ];

  (* code insures the leading poly coefficient is 1 *)
  for i := 1 to poly.polydeg + 1 do
    begin
      poly.polypoly[ 1 + i ] := (poly.polypoly[ 1 + i ])/(poly.polypoly[ 1 ]);
    end;
  poly.polypoly[ 1 ] := 1;

end;          (* end procedure *)

(*********************************************************************
*                                                                    *
*   procedure:        roots                                          *
*   version :         2.0                                            *
*   date:             6 September 85                                 *
*   description: This procedure uses the Bairstow's method of find-  *
*                ing the roots of a polynomial.                      *
*   global variables used:     degree                                *
*   gloabl variables changed:  degree                                *
*   global constants used:     maxdegl                               *
*   passed variables:          poly                                  *
*   returned variables:        poly                                  *
*   procedures called:         gotoxy,   highlight,                  *
*                              disp_msg, nohighlight,                *
*                              clear_msg, pause                      *
*   called by:        poly                                           *
*   author:           Susan K. Mashiko, Capt, USAF                   *
*                     Gary C. Tarczynski, Capt, USAF                 *
*   mod description:  Code will no longer overwrite the polynomial.  *
*   modifier:         author                                         *
*   mod date:         6 September 85                                 *
*                                                                    *
*********************************************************************)

procedure roots(var poly : polynomial);

label
  8, 9, 10, 12, 13, 16, 17, 18, 19, 20, 21, 28, 30, 40, 50, 90;

type
  b1    =     array[1..30] of real;


FILE: GETTF.PAS
```

```
  c1     =     array[1..30] of real;

var
  ui            :     real;
  vi            :     real;
  epsi          :     real;
  i, k, m       :     integer;
  real_root     :     real;
  imag_root     :     real;
  iteration     :     integer;
  b             :     b1;
  c             :     c1;
  u, v, w, z    :     real;
  rad           :     real;
  delu, delv    :     real;
  denom         :     real;
  sum, store    :     real;
  degree        :     integer;
  coeff_poly    :     array[1..maxdeg1] of real;

begin

(* initializing values *)
  ui := 0.0;
  vi := 0.0;
  epsi := 1.0E-8;
(* in order to avoid changing the degree and the coefficients of the *)
(* polynomial the following dummy variables are used                 *)
  for i := 1 to (poly.polydeg + 1) do
    coeff_poly[ i ] := poly.polypoly[ i ];
  degree := poly.polydeg;

(* Bairstow's method expects the highest coefficent to be 1 *)
  if coeff_poly[ 1 ] <> 0 then
    for i := 1 to degree do
      begin
        coeff_poly[ 1 + i ] := ( coeff_poly [ 1 + i ] ) /
                                   ( coeff_poly[ 1 ] );
      end;

   coeff_poly[ 1 ] := 1;

for i := 1 to degree do
   coeff_poly[ i ] := coeff_poly[ i + 1 ];

(* see if degree of polynomial is 0, 1, or greater than 1 *)
40: if ( degree - 1 ) < 0 then
      exit;
    if degree-1 = 0 then


FILE: GETTF.PAS
```

```
    begin
      real_root := -coeff_poly[1];
      imag_root := 0.0;
      iteration := 1;
      poly.polyfact[ degree ].realpart := real_root;
      poly.polyfact[ degree ].imagpart := imag_root;
      gotoxy( 21, 10 );
      clear_msg( 29 );
      exit;
    end
  else
      if degree = 2 then goto 8;
      if degree > 2 then goto 13;
   8: u := coeff_poly[1];
      v := coeff_poly[2];
      iteration := 1;
   9: real_root := -( u / 2 );
      rad := sqr(u) -  4.0 * v;

   (* check the sign of (u ** 2 - 4.0 * v)      *)
      if rad > 0 then goto 12;

   (* for the case of rad <= 0 continue here   *)
      rad := -rad;
      imag_root := sqrt( rad ) / 2.0;
      poly.polyfact[ degree ].realpart := real_root;
      poly.polyfact[ degree ].imagpart := imag_root;
      degree := degree - 1;
      imag_root := - imag_root;

  90: poly.polyfact[ degree ].realpart := real_root;
      poly.polyfact[ degree ].imagpart := imag_root;

  10: degree := degree - 1;

   (* check to see if polydeg is greater than zero *)
   (* if less than or equal to zero exit           *)
      if degree <= 0 then
        exit;

   (* polydeg is greater than zero continue        *)
      for i := 1 to degree do
        begin
          coeff_poly[i] := b[i];
        end;
      goto 40;

  12: imag_root := sqrt( rad ) / 2;
      w := real_root;


FILE: GETTF.PAS
```

```
       z := imag_root;
       real_root := real_root + imag_root;
       imag_root := 0;
       poly.polyfact[ degree ].realpart := real_root;
       poly.polyfact[ degree ].imagpart := imag_root;
       degree := degree - 1;
       real_root := w - z;
       goto 90;

   13: u := ui;
       v := vi;
       iteration := 1;

    (* calculate the b values                        *)
   50: b[1] := coeff_poly[1] - u;
       b[2] := coeff_poly[2] - b[1] * u - v;
       for k := 3 to degree do
          b[k] := coeff_poly[k] - b[k-1] * u - b[k-2] * v;

    (* calculate the c values                        *)
       c[1] := b[1] - u;
       c[2] := b[2] -c[1] * u - v;
       m := degree - 1;
       for k := 3 to m do
          c[k] := b[k] - c[k-1] * u - c[k-2] * v;

    (* calculate delu and delv                       *)
       if degree > 3 then goto 17;
       denom := c[degree - 1] - sqr( c[degree - 2] );
       if denom = 0 then goto 30;
       delu := ( b[degree] - b[degree - 1] * c[degree - 2] )/ denom;
   16: delv := ( c[degree - 1] * b[degree - 1] - c[degree - 2] *
                b[degree])/ denom;
       goto 18;
   17: denom := c[degree - 1] * c[degree - 3]
                - sqr( c[degree - 2] );
       if denom = 0 then goto 30;
       delu := ( b[degree] * c[degree -3] - b[degree - 1]
              * c[degree - 2]) / denom;
       goto 16;

   (* calculate new u and v values                    *)
   18: u := u + delu;
       v := v + delv;
       sum := abs(delu) + abs(delv);

    (* store the first sum calculated                 *)
       if iteration = 1 then goto 19;
       goto 20;
```

FILE: GETTF.PAS

```
19: store := sum;
    goto 21;
20: if iteration = 50 then goto 28;

    if iteration >= 5000 then
       begin
         gotoxy( 21, 1 );
         highlight;
         writeln('   ITERATING STOPPED AFTER 5000 ITERATIONS    ');
         nohighlight;
         pause;
         gotoxy( 21, 1 );
         writeln('                                              ');
         exit;
       end;

21: if sum <= epsi then goto 9;
    if iteration = 100 then
       begin
         highlight;
         gotoxy( 21, 10 );
         disp_msg( 29 );
         nohighlight;
       end;

    iteration := iteration + 1;
    goto 50;

(* see if sum after 50 iterations exceeds first sum stored *)
28: if sum < store then goto 21;
    gotoxy( 21, 10 );
    clear_msg( 29 );
    gotoxy( 21, 1 );
    highlight;
    writeln('     ERROR - Unable to converge on root of polynomial     ');
    writeln('             Enter correct polynomial                     ');
    nohighlight;
    pause;
    gotoxy( 21, 1);
    writeln('                                                          ');
    writeln('                                                          ');
    exit;

30: gotoxy( 21, 1 );
    highlight;
    writeln('     ERROR - Calculated denominator is zero               ');
    writeln('             Enter correct polynomial                     ');
    nohighlight;
    pause;
```

FILE: GETTF.PAS

```
      gotoxy( 21, 1 );
      writeln('                                                               ');
      writeln('                                                               ');
      exit;
 end;

(*********************************************************************
*                                                                    *
*   procedure:     poly                                              *
*   version:       1.2                                               *
*   date:          16 august 1983                                    *
*   description:   This procedure gets a polynomial in either        *
*                  factored or polynomial form.                      *
*   global variables used:  abort_command                            *
*   passed variables:       method, poly, disp_row, abort_command    *
*   procedures called:      get_unfact,  roots,                      *
*                           get_fact,    form_poly,                  *
*   called by:              get_tf                                   *
*   author:        vincent m. parisi ii, capt., usaf                 *
*   modified by:   Susan K. Mashiko, Capt, USAF                      *
*                  Gary C. Tarczynski, Capt, USAF                    *
*   mod description: display now done by disptf                      *
*   mod date:      25 Sep 85                                         *
*                                                                    *
*********************************************************************)

procedure poly( method : cmdword; var poly : polynomial;
                var disp_row : integer; var abort_command : boolean );
begin

  if method = 'POLY' then
    begin
      get_unfact( poly, disp_row, abort_command );
      if abort_command then exit;
      roots( poly );
    end
  else
    begin
      get_fact( poly, disp_row, abort_command );
      if abort_command then exit;
      form_poly( poly );
    end;
end;

(*********************************************************************
*                                                                    *
*       procedure:     get_tf                                        *
*       version:       3.0                                           *


FILE: GETTF.PAS
*       date:          25 September 85                                  *
*       description:   This procedure gets a transfer function in       *
*                      either polynomial or factored form.              *
*       global variables used:  abort_command                           *
*       global variables changed:  abort_command                        *
*       global constants used:  crt_only, as_assigned, max_deg          *
*       passed variables:       def_obj, method                         *
*       files written:          TF&POLS.DAT                             *
*       procedures called:      clear,     gotoxy,                      *
*                               disp_msg,  out_string,                  *
*                               get_int,   clear_msg,                   *
*                               trim,      poly,                        *
*                               disptf,    pause                        *
*       called by:     define                                           *
*       author:        vincent m. parisi ii, capt., usaf                *
*       modified by:   Susan K. Mashiko, Capt, USAF                     *
*                      Gary C. Tarczynski, Capt, USAF                   *
*       mod description: This modification converted the code from      *
*                        PASCAL MT+ to TURBO.                           *
*       mod date:      27 August 85                                     *
*       mod description: Calls disptf instead of internal procedures *
*       mod date:      25 Sep 85                                        *
*                                                                       *
*************************************************************************)

procedure disptf( var disp_obj : cmdword ); forward;

procedure get_tf( var def_obj : cmdword; var method : cmdword );

var
   num_deg        :  short_int;
   denom_deg      :  short_int;
   abort_command  :  boolean;
   stor_loc       :  integer;
   disp_row       :  integer;
   numerator      :  polynomial;
   denominator    :  polynomial;
   polys          :  file of polynomial;
   i              :  integer;

begin

  abort_command := false;
  clear;
  gotoxy( 10, 5 );
  disp_msg( 2 );

(* get the degree of the numerator *)
```

```
    repeat
      begin
        gotoxy( 10, 58 );
        out_string( '       ', crt_only );
        gotoxy( 10, 58 );
        get_int( num_deg, abort_command );
        if abort_command then exit;
        if (( num_deg > max_deg ) or ( num_deg < 0 )) then
          begin
            gotoxy( 12, 5 );
            disp_msg( 1 );
          end;
      end;
    until (( num_deg >= 0 ) and ( num_deg <= max_deg ));

  clear_msg( 1 );

(* get the degree of the denominator *)

  repeat
    begin
      gotoxy( 12, 5 );
      disp_msg( 3 );
      gotoxy( 12, 58 );
      out_string( '     ', crt_only );
      gotoxy( 12, 58 );
      get_int( denom_deg, abort_command );
      if abort_command then exit;
      if (( denom_deg > max_deg ) or ( denom_deg < 0 )) then
        begin
          gotoxy( 14, 5 );
          disp_msg( 1 );
        end;
    end;

  until (( denom_deg >= 0 ) and ( denom_deg <= max_deg ));

  clear;

  gotoxy( 0, 27 );
  disp_msg( 8 );
  gotoxy( 1, 37 );
  out_string( def_obj, as_assigned );

 (* get the numerator of the transfer function *)

  gotoxy( 2, 34 );
  disp_msg( 6 );
  disp_row := 3;


FILE: GETTF.PAS
```

```
  trim( method );
  numerator.polydeg := num_deg;
  poly( method, numerator, disp_row, abort_command );
  if abort_command then exit;

  pause;

(* if the numerator and denominator degree total less than or equal to 6 *)
(* then both are placed on the same screen. if they total greater than   *)
(* greater than eight, then get each on a separate screen. Modified to   *)
(* prevent over write by the error message                               *)

  if ( num_deg + denom_deg ) <= 6 then
    begin
      disp_row := num_deg + 9;
      gotoxy( ( disp_row - 1 ), 33 );
    end
  else
    begin
      clear;
      gotoxy( 1, 36 );
      out_string( def_obj, as_assigned );
      gotoxy( 2, 33 );
      disp_row := 3;
    end;

(* get the  denominator of the transfer function *)

  disp_msg( 7 );
  denominator.polydeg := denom_deg;
  poly( method, denominator, disp_row, abort_command );
  if abort_command then exit;

(* determine the storage location for the transfer function *)

  if def_obj = 'OLTF' then stor_loc := 0
  else
  if def_obj = 'CLTF' then stor_loc := 2
  else
  if def_obj = 'GTF' then stor_loc := 4
  else
   if def_obj = 'HTF' then stor_loc := 6
  else
  if def_obj = 'TF1' then stor_loc := 8
  else
  if def_obj = 'TF2' then stor_loc := 10
  else
  if def_obj = 'TF3' then stor_loc := 12
  else


FILE: GETTF.PAS
```

```
  if def_obj = 'TF4' then stor_loc := 14
  else
  if def_obj = 'TF5' then stor_loc := 16;

(* Now save the transfer function in the file *)

    assign( polys, 'tf&pols.dat' );
    reset( polys );

    seek( polys, stor_loc );
    write( polys, numerator );
    seek( polys, ( stor_loc + 1 ));
    write( polys, denominator );

 (* commented out by Mashiko and Tarczynski to convert to TURBO *)
 (* polys^ := numerator;                                        *)
 (* seekwrite( polys, stor_loc );                               *)
 (* polys^ := denominator;                                      *)
 (* seekwrite( polys, ( stor_loc + 1 ) );                       *)

    close( polys );
    clear;
    disptf( def_obj );

 end;
```

FILE: GETTF.PAS

```
(**************************************************************
***************************************************************
**                                                           **
**      file:                   HELP.PAS                     **
**      procedure contained:    help                         **
**      version:                3.0                          **
**      date:                   1 November 1985              **
**      description: This file contains the procedure that   **
**                   handles the logic for providing on-line help. **
**      author:      vincent m. parisi ii, capt., usaf       **
**                   Susan K. Mashiko, Capt, USAF            **
**                   Gary C. Tarczynski, Capt, USAF          **
**                                                           **
***************************************************************
**************************************************************)

(**************************************************************
*                                                             *
*       procedure:      help                                  *
*       version:        3.0                                   *
*       date:           1 November 1985                       *
*       description:    This procedure handles the logic for  *
*                       providing on line help.  The valid command *
*                       is scanned to determine what help is  *
*                       requested.  The display message routine is *
*                       then called with the number of the help *
*                       message requested.                    *
*       global variables used:          cmdbuffer             *
*       global constants used:          wordsize, buffersize  *
*       passed variables:               cmdbuffer, wordnumber *
*       procedures called:  pause, clear, disp_msg, trim      *
*       called by:              select_routine                *
*       author:         vincent m. parisi ii, capt., usaf     *
*       modified by:    Susan K. Mashiko, Capt, USAF          *
*                       Gary C. Tarczynski, Capt, USAF        *
*       mod description:  The entire procedure was replaced with *
*                       code customized for ICECAP.           *
*       mod date:       9 August 1985                         *
*       mod description:  Changed the help calls to correspond with *
*                       the changed menu                      *
*       mod date:       18 September 1985                     *
*       mod description:  Same as 18 Sep 85                   *
*       mod date:       1 Nov 85                              *
*                                                             *
**************************************************************)

procedure help( var cmdbuffer : buffer; wordnumber : integer );

const


FILE: HELP.PAS
```

```
    system_msg     = 15;
    change_msg     = 16;
    copy_msg       = 17;
    define_msg     = 18;
    display_msg    = 19;
    form_msg       = 20;
    print_msg      = 22;
    recover_msg    = 23;
    stop_msg       = 24;
    mod_msg        = 25;
    swit_msg       = 26;
    update_msg     = 27;
    help_msg       = 61;

var
    help_obj       : cmdword;

begin
  help_obj  := cmdbuffer[ wordnumber ];
  trim( help_obj );
  clear;

    if help_obj = 'SYSTEM' then disp_msg( system_msg )
  else
    if help_obj = 'CHANGE'    then disp_msg( change_msg )
  else
    if help_obj = 'COPY' then disp_msg( copy_msg )
  else
    if help_obj = 'DEFINE' then disp_msg( define_msg )
  else
    if help_obj = 'DISPLAY'  then disp_msg( display_msg )
  else
    if help_obj = 'FORM'  then disp_msg( form_msg )
  else
    if help_obj = 'PRINT'     then disp_msg( print_msg )
  else
    if help_obj = 'RECOVER'    then disp_msg( recover_msg)
  else
    if help_obj = 'STOP' then disp_msg( stop_msg )
  else
    if help_obj = 'MODIFY'  then disp_msg( mod_msg)
  else
    if help_obj = 'SWITCHES'     then disp_msg( swit_msg )
  else
    if help_obj = 'UPDATE'    then disp_msg( update_msg)
  else
    if help_obj = 'HELP' then disp_msg( help_msg );
  pause;
  clear;
```

FILE: HELP.PAS

```
end;
```

```
(**********************************************************************
***********************************************************************
**                                          **         Z100          **
**      file:           ICECAPPC.PAS        **  floppy disk version  **
**      program contained: ICECAPPC         ***************************
**      version:        9.00                                         **
**      date:           11 Oct 1985                                  **
**      description:    This file contains the main program for      **
**                      the MICROSDW menu system and the subroutines**
**                      for ICECAP-PC. These subroutines comprise a **
**                      CAD package for control system design and    **
**                      analysis.                                    **
**      author:         Gary C. Tarczynski, Capt, USAF               **
**                      Susan K. Mashiko, Capt, USAF                 **
**                                                                   **
***********************************************************************
**********************************************************************)

(**********************************************************************
*                                           *          Z100           *
*       program:        ICECAPPC            *  floppy disk version    *
*       version:        9.0                 ***************************
*       date:           11 Oct 1985                                   *
*       description:    This program provides a flexible user         *
*                       interface for software development or         *
*                       other applications.  This program also con-   *
*                       tains the ICECAP-PC subroutines.              *
*       procedures called: get_cmd, pause, ClearScreen, get_data,     *
*                          select_routine                             *
*       authors:        Gary C. Tarczynski, Capt, USAF                *
*                       Susan K. Mashiko, Capt, USAF                  *
*                                                                     *
**********************************************************************)

program ICECAPPC;

{$I msdwcons.pas}
{$I msdwtype.pas}

const
    wordsize        = 12;
    buffersize      =  6;
    stat_line_width = 77;
    crt_only        = 'c';
    terminal_only   = 't';
    as_assigned     = 'a';
    backspace       =   8;
    del             = 127;
    yes             = true;
    no              = false;
    abort_str       = '$';

type
    term_array  = array[ 1..term_length ] of byte;
    print_array = array[ 1..printer_length ] of byte;
    msg_array   = array[ 1..num_msg_dir ] of msg;

    buffer      = array[ 1..buffersize ] of string[ wordsize ];

    cmdword     = string[ wordsize ];
    msg_line    = string[ screen_width ];

    dictionary  = record
        dictword  : cmdword;
        matchp    : integer;
        nomatchp  : integer;
        abbrev    : byte;       (* minimum length of abbreviation *)
      end;

var
    cmdbuffer      : buffer;  (* buffer of command words *)
    blanks         : string[ screen_width ];
    status_line    : string[ stat_line_width ];
    call_routine   : cmdword;
    abort_command  : boolean;
    trans          : boolean;
    printer        : boolean;
    temp           : boolean;
    crt            : boolean;
    macro_error    : boolean;
    show_abbreviation : boolean;
    in_terminal    : boolean;
    stat_on        : boolean;
    macro_file     : text;
    trans_file     : text;
    list_dev       : text;
    temp_file      : text;
    real_error     : byte;
    help_level     : byte;
    term           : term_array;
    print          : print_array;
    msg_dir        : msg_array;
    decode_dict    : dict_buffer;
    msg_txt        : file of msg_line;
    strng          : msg_line;
    decode         : dictionary;
    list_dev_name : paramstring;
    trans_file_name : paramstring;


FILE: ICECAPPC.PAS     *** Z100 floppy disk version ***
```

```
    macro_file_name : paramstring;
    number_of_commands : integer;

{$I concons.pas }  (* added 14 Aug 85 these declarations are *)
                   (* unique to the controls package ICECAP  *)

(*************************************************************
*     Include the sources for the routines called by MICROSDW    *
*************************************************************)

{$I ucase.pas }
{$I terminal.pas }
{$I output.pas }
{$I pause.pas }
{$I getdat.pas }
{$I msg.pas }
{$I instruct.pas }
{$I getline.pas }
{$I promptne.pas }
{$I promptcm.pas }
{$I trim.pas }
{$I displayc.pas }
{$I getint.pas }
{$I getstrin.pas }
{$I readcom.pas }
{$I proceser.pas }
{$I valndec.pas }
{$I getcom.pas }

{$I b:recover.pas } (* added 9 Sep 85  *)
{$I b:update.pas }  (* added 9 Sep 85  *)
{$I b:copy.pas }    (* added 5 Sep 85  *)
{$I b:help.pas }    (* added 9 Aug 85  *)
{$I b:reals.pas }   (* added 13 Aug 85 *)
{$I b:gettf.pas }   (* added 13 Aug 85 *)
{$I b:getmat.pas }  (* added 11 Sep 85 *)
{$I b:matrxman.pas }(* added 20 Sep 85 *)
{$I b:matrix.pas }  (* added 20 Sep 85 *)
{$I b:polyman.pas } (* added 4 Sep 85  *)
{$I b:poly.pas }    (* added 5 Sep 85  *)
{$I b:form.pas }    (* added 7 Oct 85  *)
{$I b:define.pas }  (* added 12 Aug 85 *)
{$I b:inroot.pas }  (* added 8 Sep 85  *)
{$I b:delroot.pas } (* added 7 Sep 85  *)
{$I b:modify.pas }  (* added 23 Sep 85 *)
{$I b:disp.pas }    (* added 4 Sep 85  *)
{$I b:bode.pas }    (* added 11 Oct 85 *)
{$I b:select.pas }  (* modified Sep 85 *)


FILE: ICECAPPC.PAS     *** Z100 floppy disk version ***
```

```
(**********************************************************
*                    main program code                    *
**********************************************************)

begin          (*  begin main program  *)

(************************************************************
*                                                           *
*       initialize the program;  read in all the initializing  *
*       parameters, the command syntax data structure.  put up *
*       title slide to show CRT interface is working and give  *
*       user something to look at.                          *
*       Also initialize all files used by the MICROSDW.     *
*                                                           *
************************************************************)

get_data( term, print, msg_dir, decode_dict, printer,
          trans, temp, crt, show_abbreviation, in_terminal,
          stat_on, macro_error, help_level,
          list_dev_name, trans_file_name, macro_file_name );

pause;

(************************************************************
*               begin main logic statements                 *
************************************************************)

repeat
    get_cmd( cmdbuffer, call_routine, number_of_commands );
    select_routine( call_routine, cmdbuffer, number_of_commands );
until (call_routine = 'STOP');
ClearScreen;
end.          (*  end of main program  *)
```

```
(*********************************************************************
**********************************************************************
**                                                **       Z100        **
**      file:           ICECAPPC.PAS              **  hard disk version  **
**      program contained: ICECAPPC               *************************
**      version:        9.00                                           **
**      date:           11 Oct 1985                                    **
**      description:    This file contains the main program for        **
**                      the MICROSDW menu system and the subroutines**
**                      for ICECAP-PC. These subroutines comprise a **
**                      CAD package for control system design and     **
**                      analysis.                                      **
**      author:         Gary C. Tarczynski, Capt, USAF                **
**                      Susan K. Mashiko, Capt, USAF                  **
**                                                                     **
**********************************************************************
*********************************************************************)

(*********************************************************************
*                                                  *       Z100         *
*       program:        ICECAPPC                   *  hard disk version  *
*       version:        9.0                        ***********************
*       date:           11 Oct 1985                                     *
*       description:    This program provides a flexible user           *
*                       interface for software development or           *
*                       other applications.  This program also con-     *
*                       tains the ICECAP-PC subroutines.                *
*       procedures called: get_cmd, pause, ClearScreen, get_data,       *
*                          select_routine                               *
*       authors:        Gary C. Tarczynski, Capt, USAF                  *
*                       Susan K. Mashiko, Capt, USAF                    *
*                                                                       *
*********************************************************************)

program ICECAPPC;

{$I msdwcons.pas}
{$I msdwtype.pas}

const
    wordsize        = 12;
    buffersize      =  6;
    stat_line_width = 77;
    crt_only        = 'c';
    terminal_only   = 't';
    as_assigned     = 'a';
    backspace       =   8;
    del             = 127;
    yes             = true;
    no              = false;
    abort_str       = '$';

type
    term_array  = array[ 1..term_length ] of byte;
    print_array = array[ 1..printer_length ] of byte;
    msg_array   = array[ 1..num_msg_dir ] of msg;

    buffer      = array[ 1..buffersize ] of string[ wordsize ];

    cmdword     = string[ wordsize ];
    msg_line    = string[ screen_width ];

    dictionary  = record
        dictword  : cmdword;
        matchp    : integer;
        nomatchp  : integer;
        abbrev    : byte;       (* minimum length of abbreviation *)
      end;

var
    cmdbuffer      : buffer;  (* buffer of command words *)
    blanks         : string[ screen_width ];
    status_line    : string[ stat_line_width ];
    call_routine   : cmdword;
    abort_command : boolean;
    trans          : boolean;
    printer        : boolean;
    temp           : boolean;
    crt            : boolean;
    macro_error    : boolean;
    show_abbreviation : boolean;
    in_terminal    : boolean;
    stat_on        : boolean;
    macro_file     : text;
    trans_file     : text;
    list_dev       : text;
    temp_file      : text;
    real_error     : byte;
    help_level     : byte;
    term           : term_array;
    print          : print_array;
    msg_dir        : msg_array;
    decode_dict    : dict_buffer;
    msg_txt        : file of msg_line;
    strng          : msg_line;
    decode         : dictionary;
    list_dev_name : paramstring;
    trans_file_name : paramstring;
```

FILE: ICECAPPC.PAS   *** Z100 hard disk version ***

```
    macro_file_name : paramstring;
    number_of_commands : integer;

{$I concons.pas }  (* added 14 Aug 85 these declarations are *)
                   (* unique to the controls package ICECAP  *)

(*****************************************************************
*     Include the sources for the routines called by MICROSDW     *
*****************************************************************)

{$I ucase.pas }
{$I terminal.pas }
{$I output.pas }
{$I pause.pas }
{$I getdat.pas }
{$I msg.pas }
{$I instruct.pas }
{$I getline.pas }
{$I prompthe.pas }
{$I promptcm.pas }
{$I trim.pas }
{$I displayc.pas }
{$I getint.pas }
{$I getstrin.pas }
{$I readcom.pas }
{$I proceser.pas }
{$I valndec.pas }
{$I getcom.pas }

{$I recover.pas } (* added 9 Sep 85  *)
{$I update.pas }  (* added 9 Sep 85  *)
{$I copy.pas }    (* added 5 Sep 85  *)
{$I help.pas }    (* added 9 Aug 85  *)
{$I reals.pas }   (* added 13 Aug 85 *)
{$I gettf.pas }   (* added 13 Aug 85 *)
{$I getmat.pas }  (* added 11 Sep 85 *)
{$I matrxman.pas }(* added 20 Sep 85 *)
{$I matrix.pas }  (* added 20 Sep 85 *)
{$I polyman.pas } (* added 4 Sep 85  *)
{$I poly.pas }    (* added 5 Sep 85  *)
{$I form.pas }    (* added 7 Oct 85  *)
{$I define.pas }  (* added 12 Aug 85 *)
{$I inroot.pas }  (* added 8 Sep 85  *)
{$I delroot.pas } (* added 7 Sep 85  *)
{$I modify.pas }  (* added 23 Sep 85 *)
{$I disp.pas }    (* added 4 Sep 85  *)
{$I bode.pas }    (* added 11 Oct 85 *)
{$I select.pas }  (* modified Sep 85 *)
```

FILE: ICECAPPC.PAS   *** Z100 hard disk version ***

```
(************************************************************
*                       main program code                   *
************************************************************)

begin          (*  begin main program  *)

(*****************************************************************
*                                                                *
*       initialize the program;  read in all the initializing   *
*       parameters, the command syntax data structure.  put up  *
*       title slide to show CRT interface is working and give   *
*       user something to look at.                              *
*       Also initialize all files used by the MICROSDW.         *
*                                                                *
*****************************************************************)

get_data( term, print, msg_dir, decode_dict, printer,
          trans, temp, crt, show_abbreviation, in_terminal,
          stat_on, macro_error, help_level,
          list_dev_name, trans_file_name, macro_file_name );

pause;

(*****************************************************************
*                 begin main logic statements                   *
*****************************************************************)

repeat
    get_cmd( cmdbuffer, call_routine, number_of_commands );
    select_routine( call_routine, cmdbuffer, number_of_commands );
until (call_routine = 'STOP');
ClearScreen;
end.          (*  end of main program  *)
```

```
(****************************************************************
*****************************************************************
**                                          **      IBM ONLY      **
**      file:              ICECAPPC.PAS     **  floppy disk version **
**      program contained: ICECAPPC         **************************
**      version:           9.00                                    **
**      date:              11 Oct 1985                             **
**      description:       This file contains the main program for **
**                         the MICROSDW menu system and the subroutines**
**                         for ICECAP-PC. These subroutines comprise a **
**                         CAD package for control system design and   **
**                         analysis.                                   **
**      author:            Gary C. Tarczynski, Capt, USAF              **
**                         Susan K. Mashiko, Capt, USAF                **
**                                                                     **
*****************************************************************
****************************************************************)

(****************************************************************
*                                            *      IBM ONLY       *
*       program:           ICECAPPC          *  floppy disk version *
*       version:           9.0               ************************
*       date:              11 Oct 1985                              *
*       description:       This program provides a flexible user    *
*                          interface for software development or    *
*                          other applications.  This program also con-  *
*                          tains the ICECAP-PC subroutines.          *
*       procedures called: get_cmd, pause, ClearScreen, get_data,   *
*                              select_routine                       *
*       authors:           Gary C. Tarczynski, Capt, USAF           *
*                          Susan K. Mashiko, Capt, USAF             *
*                                                                   *
****************************************************************)

program ICECAPPC;

{$I msdwcons.pas}
{$I msdwtype.pas}

const
    wordsize        = 12;
    buffersize      =  6;
    stat_line_width = 77;
    crt_only        = 'c';
    terminal_only   = 't';
    as_assigned     = 'a';
    backspace       =   8;
    del             = 127;
    yes             = true;
    no              = false;
    abort_str       = '$';

type
    term_array  = array[ 1..term_length ] of byte;
    print_array = array[ 1..printer_length ] of byte;
    msg_array   = array[ 1..num_msg_dir ] of msg;

    buffer      = array[ 1..buffersize ] of string[ wordsize ];

    cmdword     = string[ wordsize ];
    msg_line    = string[ screen_width ];

    dictionary  = record
        dictword  : cmdword;
        matchp    : integer;
        nomatchp  : integer;
        abbrev    : byte;      (* minimum length of abbreviation *)
      end;

(*INSERT***INSERT***INSERT***INSERT***INSERT***INSERT***INSERT**

          This type declaration was added by Tarczynski
          and Mashiko to be able to use the MS-DOS
          function call in the procedure standard_output.*)

    regpak      = record
        al,ah,bl,bh,cl,ch,dl,dh :  byte;
        ax,bx,cx,dx,bp,si,di,ds,es,flags :  integer;
      end;

(*INSERT***INSERT***INSERT***INSERT***INSERT***INSERT***INSERT*)

var
    cmdbuffer      : buffer;  (* buffer of command words *)
    blanks         : string[ screen_width ];
    status_line    : string[ stat_line_width ];
    call_routine   : cmdword;
    abort_command  : boolean;
    trans          : boolean;
    printer        : boolean;
    temp           : boolean;
    crt            : boolean;
    macro_error    : boolean;
    show_abbreviation : boolean;
    in_terminal    : boolean;
    stat_on        : boolean;
    macro_file     : text;
    trans_file     : text;


FILE: ICECAPPC.PAS     *** IBM ONLY floppy disk version ***
```

```
    list_dev      : text;
    temp_file     : text;
    real_error    : byte;
    help_level    : byte;
    term          : term_array;
    print         : print_array;
    msg_dir       : msg_array;
    decode_dict   : dict_buffer;
    msg_txt       : file of msg_line;
    strng         : msg_line;
    decode        : dictionary;
    list_dev_name : paramstring;
    trans_file_name : paramstring;
    macro_file_name : paramstring;
    number_of_commands : integer;

{$I concons.pas }  (* added 14 Aug 85 these declarations are *)
                   (* unique to the controls package ICECAP  *)

(*****************************************************************
*     Include the sources for the routines called by MICROSDW     *
*****************************************************************)

(*INSERT***INSERT***INSERT***INSERT***INSERT***INSERT***INSERT**

          This statement was added by Tarczynski and
          Mashiko to include the file containing the
          procedure standard_output.*)

{$I stdout.pas}

(*INSERT***INSERT***INSERT***INSERT***INSERT***INSERT***INSERT*)

{$I ucase.pas }
{$I terminal.pas }
{$I output.pas }
{$I pause.pas }
{$I getdat.pas }
{$I msg.pas }
{$I instruct.pas }
{$I getline.pas }
{$I prompthe.pas }
{$I promptcm.pas }
{$I trim.pas }
{$I displayc.pas }
{$I getint.pas }
{$I getstrin.pas }
{$I readcom.pas }
{$I proceser.pas }


FILE: ICECAPPC.PAS     *** IBM ONLY floppy disk version ***
```

```
{$I valndec.pas }
{$I getcom.pas }

{$I b:recover.pas } (* added 9 Sep 85  *)
{$I b:update.pas }  (* added 9 Sep 85  *)
{$I b:copy.pas }    (* added 5 Sep 85  *)
{$I b:help.pas }    (* added 9 Aug 85  *)
{$I b:reals.pas }   (* added 13 Aug 85 *)
{$I b:gettf.pas }   (* added 13 Aug 85 *)
{$I b:getmat.pas }  (* added 11 Sep 85 *)
{$I b:matrxman.pas }(* added 20 Sep 85 *)
{$I b:matrix.pas }  (* added 20 Sep 85 *)
{$I b:polyman.pas } (* added 4 Sep 85  *)
{$I b:poly.pas }    (* added 5 Sep 85  *)
{$I b:form.pas }    (* added 7 Oct 85  *)
{$I b:define.pas }  (* added 12 Aug 85 *)
{$I b:inroot.pas }  (* added 8 Sep 85  *)
{$I b:delroot.pas } (* added 7 Sep 85  *)
{$I b:modify.pas }  (* added 23 Sep 85 *)
{$I b:disp.pas }    (* added 4 Sep 85  *)
{$I b:bode.pas }    (* added 11 Oct 85 *)
{$I b:select.pas }  (* modified Sep 85 *)

(***********************************************************
*                     main program code                    *
***********************************************************)

begin          (*  begin main program  *)

(***************************************************************
*                                                              *
*       initialize the program;  read in all the initializing  *
*       parameters, the command syntax data structure.  put up *
*       title slide to show CRT interface is working and give  *
*       user something to look at.                             *
*       Also initialize all files used by the MICROSDW.        *
*                                                              *
***************************************************************)

(*INSERT***INSERT***INSERT***INSERT***INSERT***INSERT***INSERT**

          This statement was added by Tarczynski and
          Mashiko to reroute screen output through the
          procedure standard_output.  From now on, all
          output to the terminal via WRITE or WRITELN
          will be redirected through ANSI.SYS, thereby
          allowing the IBM PC to recognize escape codes.*)

ConOutPtr := Ofs(standard_output);


FILE: ICECAPPC.PAS     *** IBM ONLY floppy disk version ***
```

```
(*INSERT***INSERT***INSERT***INSERT***INSERT***INSERT***INSERT*)

get_data( term, print, msg_dir, decode_dict, printer,
          trans, temp, crt, show_abbreviation, in_terminal,
          stat_on, macro_error, help_level,
          list_dev_name, trans_file_name, macro_file_name );

pause;

(****************************************************************
*               begin main logic statements                    *
****************************************************************)

repeat
    get_cmd( cmdbuffer, call_routine, number_of_commands );
    select_routine( call_routine, cmdbuffer, number_of_commands );
until (call_routine = 'STOP');
ClearScreen;
end.          (*  end of main program  *)
```

```
(**********************************************************************
***********************************************************************
**                                                 **      IBM ONLY      **
**      file:            ICECAPPC.PAS              **  hard disk version **
**      program contained: ICECAPPC                ************************
**      version:         9.00                                          **
**      date:            11 Oct 1985                                   **
**      description:     This file contains the main program for       **
**                       the MICROSDW menu system and the subroutines**
**                       for ICECAP-PC. These subroutines comprise a **
**                       CAD package for control system design and     **
**                       analysis.                                     **
**      author:          Gary C. Tarczynski, Capt, USAF                **
**                       Susan K. Mashiko, Capt, USAF                  **
**                                                                     **
***********************************************************************
**********************************************************************)

(**********************************************************************
*                                                  *      IBM ONLY      *
*       program:         ICECAPPC                  *  hard disk version *
*       version:         9.0                       ************************
*       date:            11 Oct 1985                                    *
*       description:     This program provides a flexible user          *
*                        interface for software development or          *
*                        other applications.  This program also con-    *
*                        tains the ICECAP-PC subroutines.               *
*       procedures called: get_cmd, pause, ClearScreen, get_data,       *
*                              select_routine                           *
*       authors:         Gary C. Tarczynski, Capt, USAF                 *
*                        Susan K. Mashiko, Capt, USAF                   *
*                                                                       *
**********************************************************************)

program ICECAPPC;

{$I msdwcons.pas}
{$I msdwtype.pas}

const
    wordsize        = 12;
    buffersize      =  6;
    stat_line_width = 77;
    crt_only        = 'c';
    terminal_only   = 't';
    as_assigned     = 'a';
    backspace       =   8;
    del             = 127;
    yes             = true;


FILE: ICECAPPC.PAS     *** IBM ONLY hard disk version ***
```

```
    no              = false;
    abort_str       = '$';

type
    term_array  = array[ 1..term_length ] of byte;
    print_array = array[ 1..printer_length ] of byte;
    msg_array   = array[ 1..num_msg_dir ] of msg;

    buffer      = array[ 1..buffersize ] of string[ wordsize ];

    cmdword     = string[ wordsize ];
    msg_line    = string[ screen_width ];

    dictionary  = record
        dictword  : cmdword;
        matchp    : integer;
        nomatchp  : integer;
        abbrev    : byte;      (* minimum length of abbreviation *)
      end;

(*INSERT***INSERT***INSERT***INSERT***INSERT***INSERT***INSERT**

          This type declaration was added by Tarczynski
          and Mashiko to be able to use the MS-DOS
          function call in the procedure standard_output.*)

    regpak      = record
        al,ah,bl,bh,cl,ch,dl,dh :  byte;
        ax,bx,cx,dx,bp,si,di,ds,es,flags :  integer;
      end;

(*INSERT***INSERT***INSERT***INSERT***INSERT***INSERT***INSERT*)

var
    cmdbuffer     : buffer;  (* buffer of command words *)
    blanks        : string[ screen_width ];
    status_line   : string[ stat_line_width ];
    call_routine  : cmdword;
    abort_command : boolean;
    trans         : boolean;
    printer       : boolean;
    temp          : boolean;
    crt           : boolean;
    macro_error   : boolean;
    show_abbreviation : boolean;
    in_terminal   : boolean;
    stat_on       : boolean;
    macro_file    : text;
    trans_file    : text;


FILE: ICECAPPC.PAS     *** IBM ONLY hard disk version ***
```

```
    list_dev       : text;
    temp_file      : text;
    real_error     : byte;
    help_level     : byte;
    term           : term_array;
    print          : print_array;
    msg_dir        : msg_array;
    decode_dict    : dict_buffer;
    msg_txt        : file of msg_line;
    strng          : msg_line;
    decode         : dictionary;
    list_dev_name  : paramstring;
    trans_file_name : paramstring;
    macro_file_name : paramstring;
    number_of_commands : integer;

{$I concons.pas }  (* added 14 Aug 85 these declarations are *)
                   (* unique to the controls package ICECAP  *)

(*************************************************************
*     Include the sources for the routines called by MICROSDW    *
*************************************************************)

(*INSERT***INSERT***INSERT***INSERT***INSERT***INSERT***INSERT**

          This statement was added by Tarczynski and
          Mashiko to include the file containing the
          procedure standard_output.*)

{$I stdout.pas}

(*INSERT***INSERT***INSERT***INSERT***INSERT***INSERT***INSERT*)

{$I ucase.pas }
{$I terminal.pas }
{$I output.pas }
{$I pause.pas }
{$I getdat.pas }
{$I msg.pas }
{$I instruct.pas }
{$I getline.pas }
{$I prompthe.pas }
{$I promptcm.pas }
{$I trim.pas }
{$I displayc.pas }
{$I getint.pas }
{$I getstrin.pas }
{$I readcom.pas }
{$I proceser.pas }


FILE: ICECAPPC.PAS     *** IBM ONLY hard disk version ***
```

```
{$I valndec.pas }
{$I getcom.pas }

{$I recover.pas } (* added 9 Sep 85  *)
{$I update.pas }  (* added 9 Sep 85  *)
{$I copy.pas }    (* added 5 Sep 85  *)
{$I help.pas }    (* added 9 Aug 85  *)
{$I reals.pas }   (* added 13 Aug 85 *)
{$I gettf.pas }   (* added 13 Aug 85 *)
{$I getmat.pas }  (* added 11 Sep 85 *)
{$I matrxman.pas }(* added 20 Sep 85 *)
{$I matrix.pas }  (* added 20 Sep 85 *)
{$I polyman.pas } (* added 4 Sep 85  *)
{$I poly.pas }    (* added 5 Sep 85  *)
{$I form.pas }    (* added 7 Oct 85  *)
{$I define.pas }  (* added 12 Aug 85 *)
{$I inroot.pas }  (* added 8 Sep 85  *)
{$I delroot.pas } (* added 7 Sep 85  *)
{$I modify.pas }  (* added 23 Sep 85 *)
{$I disp.pas }    (* added 4 Sep 85  *)
{$I bode.pas }    (* added 11 Oct 85 *)
{$I select.pas }  (* modified Sep 85 *)

(************************************************************
*                     main program code                    *
************************************************************)

begin          (*  begin main program  *)

(*****************************************************************
*                                                               *
*       initialize the program;  read in all the initializing   *
*       parameters, the command syntax data structure.  put up  *
*       title slide to show CRT interface is working and give   *
*       user something to look at.                              *
*       Also initialize all files used by the MICROSDW.         *
*                                                               *
*****************************************************************)

(*INSERT***INSERT***INSERT***INSERT***INSERT***INSERT***INSERT**

          This statement was added by Tarczynski and
          Mashiko to reroute screen output through the
          procedure standard_output.  From now on, all
          output to the terminal via WRITE or WRITELN
          will be redirected through ANSI.SYS, thereby
          allowing the IBM PC to recognize escape codes.*)

ConOutPtr := Ofs(standard_output);
```

```
(*INSERT***INSERT***INSERT***INSERT***INSERT***INSERT***INSERT*)

get_data( term, print, msg_dir, decode_dict, printer,
          trans, temp, crt, show_abbreviation, in_terminal,
          stat_on, macro_error, help_level,
          list_dev_name, trans_file_name, macro_file_name );

pause;

(****************************************************************
*                begin main logic statements                   *
****************************************************************)

repeat
    get_cmd( cmdbuffer, call_routine, number_of_commands );
    select_routine( call_routine, cmdbuffer, number_of_commands );
until (call_routine = 'STOP');
ClearScreen;
end.          (*  end of main program  *)
```

```
***********************************************************************
***********************************************************************
**                                                                   **
**    file:          INROOT.PAS                                      **
**    procedure contained: inroot                                    **
**    version:       2.0                                             **
**    date:          19 September 85                                 **
**    description:   This file contains the procedures to insert     **
**                   a root from a polynomial. If the root is com-   **
**                   plex the conjugate will also be added.          **
**    author:        Susan K. Mashiko, Capt, USAF                    **
**                   Gary C. Tarczynski, Capt, USAF                  **
**                                                                   **
***********************************************************************
**********************************************************************)

(**********************************************************************
*                                                                     *
*   procedure:     inroot                                             *
*   version:       2.0                                                *
*   date:          19 September 85                                    *
*   description:   This procedure will insert a root from a polyno-   *
*                  mial. If the root is complex the conjugate will    *
*                  also be inserted.                                  *
*   global variables used:      cmdbuffer, abort_command              *
*   global constants used:      crt_only, as_assigned                 *
*   passed variables:           cmdbuffer, wordnumber                 *
*   files read:                 TF&POLS.DAT                           *
*   files written:              TF&POLS.DAT                           *
*   procedures called:          clear,  gotoxy,  disppoly,            *
*                               trim,   out_real,  out_string,        *
*                               get_r_num,  out_int,  form_poly,      *
*                               pause                                 *
*   called by:     select                                             *
*   author:        Susan K. Mashiko, Capt, USAF                       *
*                  Gary C. Tarczynski, Capt, USAF                     *
*   mod description:  Changes wer made to he code to compensate for   *
*                     a call from a lower level                       *
*   modified by:   author                                             *
*   mod date:      19 Sep 85                                          *
*                                                                     *
**********************************************************************)

overlay procedure inroot( var cmdbuffer : buffer; var wordnumber : integer );

var
  choice      : cmdword;
  polys       : file of polynomial;
  i           : integer;


FILE: INROOT.PAS
```

```
  oldpoly     : polynomial;
  newpoly     : polynomial;
  stor_loc    : integer;
  number      : real;

begin
  clear;
  choice := cmdbuffer[ 3 ];
  trim( choice );
  if choice = 'POLYA' then stor_loc := 18
  else
  if choice = 'POLYB' then stor_loc := 19
  else
  if choice = 'POLYC' then stor_loc := 20
  else
  if choice = 'POLYD' then stor_loc := 21
  else
  if choice = 'POLYE' then stor_loc := 22
  else
  if choice = 'ONPOLY' then stor_loc := 0
  else
  if choice = 'ODPOLY' then stor_loc := 1
  else
  if choice = 'CNPOLY' then stor_loc := 2
  else
  if choice = 'CDPOLY' then stor_loc := 3
  else
  if choice = 'GNPOLY' then stor_loc := 4
  else
  if choice = 'GDPOLY' then stor_loc := 5
  else
  if choice = 'HNPOLY' then stor_loc := 6
  else
  if choice = 'HDPOLY' then stor_loc := 7;

  (* pull the desired polynomial from storage *)
  assign( polys, 'tf&pols.dat' );
  reset( polys );
  seek( polys, stor_loc);
  read( polys, oldpoly );
  close( polys );

  (* display the polynomial *)
  disppoly( choice );

  (* copy all of the existing roots into the new polynomial *)
  for i := 1 to oldpoly.polydeg do
    begin
      newpoly.polyfact[ i ].realpart := oldpoly.polyfact[ i ].realpart;
```

FILE: INROOT.PAS

```
    newpoly.polyfact[ i ].imagpart := oldpoly.polyfact[ i ].imagpart;
  end;

(* add the new root number to the form on the screen *)
gotoxy( ( 7 + oldpoly.polydeg ), 40 );
out_int( ( oldpoly.polydeg + 1 ), 2, crt_only );

(* add the j to the form on the screen *)
gotoxy( ( 7 + oldpoly.polydeg ), 57 );
out_string( 'j', as_assigned );

(* get the new roots from the terminal *)
get_r_num( number, ( 7 + oldpoly.polydeg ), 43, abort_command );
if abort_command then exit;
newpoly.polyfact[ oldpoly.polydeg + 1 ].realpart := number;

(* get the imaginary portion of the pole or zero for this root *)
get_r_num( number, ( 7 + oldpoly.polydeg ), 59, abort_command );
if abort_command then exit;
newpoly.polyfact[ oldpoly.polydeg + 1 ].imagpart := number;

(* If the root is complex the conjugate will be generated and *)
(* displayed. The negative conjugate will be displayed first  *)
if (( number < -0.000001 ) or ( number > 0.000001 )) then
  begin
    newpoly.polyfact[ oldpoly.polydeg + 2 ].realpart :=
                newpoly.polyfact[ oldpoly.polydeg + 1 ].realpart;
    gotoxy( ( 8 + oldpoly.polydeg ), 43 );
    out_real( newpoly.polyfact[ oldpoly.polydeg + 2 ].realpart,
                12, as_assigned);
    gotoxy( ( 7 + oldpoly.polydeg ), 59 );
    if number < 0.0 then
      begin
        newpoly.polyfact[ oldpoly.polydeg + 1 ].imagpart := number;
        out_real( number, 12, as_assigned );
        newpoly.polyfact[ oldpoly.polydeg + 2 ].imagpart :=
                ( number * ( -1.0 ) );
      end
    else
      begin
        newpoly.polyfact[ oldpoly.polydeg + 1 ].imagpart :=
                ( number * ( -1.0 ) );
        out_real( number, 12, as_assigned );
        newpoly.polyfact[ oldpoly.polydeg + 2 ].imagpart := number;
      end;
    gotoxy( ( 8 + oldpoly.polydeg ), 59 );
    out_real( newpoly.polyfact[ oldpoly.polydeg + 1 ].imagpart,
                12, as_assigned );
    newpoly.polydeg := oldpoly.polydeg + 2;
```

FILE: INROOT.PAS

```
    end
  else
    newpoly.polydeg := oldpoly.polydeg + 1;

  newpoly.coefficient := oldpoly.coefficient;

  (* form the polynomial *)
  form_poly( newpoly );

  (* store the new polynomial in the same stor_loc as the old *)
  assign( polys, 'tf&pols.dat' );
  reset( polys );
  seek( polys, stor_loc);
  write( polys, newpoly );

  (* display the new polynomial *)
  disppoly( choice );
  pause;
end;
```

FILE: INROOT.PAS

```
(*********************************************************************
**********************************************************************
**                                                                  **
**      file:           INSTRUCT.PAS                                **
**      procedures contained: instruction                           **
**      version:        1.1                                         **
**      date:           16 August 1983                              **
**      description:    This file contains the procedure that      **
**                      issues instructions for entering command-   **
**                      words.                                      **
**      author:         vincent m. parisi ii, capt, usaf            **
**                                                                  **
**********************************************************************
*********************************************************************)

(*********************************************************************
*                                                                    *
*       procedure:      instruction                                  *
*       version:        1.1                                          *
*       date:           16 august 1983                               *
*       description:    This procedure issues the appropriate        *
*                       instruction for entering a command           *
*                       based on the number of command words         *
*                       already entered.                             *
*       passed variables:          level, instr_row, instr_col       *
*       procedures called:         out_string                        *
*       called by:                 getcom                            *
*       author:         vincent m. parisi ii, capt., usaf            *
*                                                                    *
*********************************************************************)

procedure instruction
                ( level : integer; instr_row : integer; instr_col : integer );

begin

  if level = 1 then
    out_string( 'Enter one of the following initial command words...', 'c')
  else
    out_string
        ( 'Now enter one of these commandwords, or "$" to abort...', 'c' );
end;
```

FILE: INSTRUCT.PAS

```
(**********************************************************************
***********************************************************************
**                                                                   **
**   file:          MATRIX.PAS                                       **
**   procedures contained:   disp_matrx,    matrx_manip1,            **
**                           matrx_manip2,  get_matrx_name,          **
**                           mmatrix                                 **
**   version:       1.0                                              **
**   date:          22 Sep 85                                        **
**   description:   This file contains the procedures to display and **
**                  manipulate matrices.                             **
**   author:        Susan K. Mashiko, Capt, USAF                     **
**                  Gary C. Tarczynski, Capt, USAF                   **
**                                                                   **
***********************************************************************
**********************************************************************)

(*********************************************************************
*                                                                    *
*   procedure:    disp_matrx                                         *
*   version:      1.0                                                *
*   date:         20 Septembe85                                      *
*   description:  This procedure will display a matrix from a        *
*                 record in matrix.dat The user should place a pause *
*                 in his/her code after the calling subroutine to    *
*                 keep the display on the screen.                    *
*   global constants used:    as_assigned                            *
*   passed variables:         choice                                 *
*   returned variables:       choice                                 *
*   files read:               MATRIX.DAT                             *
*   procedures called:        clear,       gotoxy,                   *
*                             out_string,  disp_msg,                 *
*                             make_pretty_small_matrix,              *
*                             make_pretty_large_matrix_one,          *
*                             make_pretty_large_matrix_two,          *
*                             out_real,    trim,                     *
*                             pause                                  *
*   called by:    matrx_manip1,    matrx_manip2,     mmatrix         *
*   author:       Susan K. Mashiko, Capt, USAF                       *
*                 Gary C. Tarczynski, Capt, USAF                     *
*                                                                    *
*********************************************************************)

procedure disp_matrx( var choice : cmdword );

var
  stor_loc    : integer;
  mats        : file of matrix;
  col_element : integer;


FILE: MATRIX.PAS
```

```
  i           : integer;
  j           : integer;
  number      : real;
  mat         : matrix;
  num_row     : integer;
  num_col     : integer;
  row         : integer;
  col         : integer;

begin
  trim( choice );
  if choice = 'MATA' then stor_loc := 0
  else
  if choice = 'MATB' then stor_loc := 1
  else
  if choice = 'MATC' then stor_loc := 2
  else
  if choice = 'MATD' then stor_loc := 3
  else
  if choice = 'MATE' then stor_loc := 4;

  assign( mats, 'matrix.dat' );
  reset( mats );
  seek( mats, stor_loc);
  read( mats, mat );
  close( mats );

  (* put the title on the screen *)
  clear;
  gotoxy( 1, 32 );
  disp_msg( 50 );
  gotoxy( 2, 37 );
  out_string( choice, as_assigned );
  num_col := mat.num_cols;
  num_row := mat.num_rows;
  row := 5;
  col := 10;

  (* if the matrix is small (i.e. 5 columns or less) display *)
  if num_col <= 5 then
    begin
      make_pretty_small_matrix( num_row, num_col );
      for j := 0 to ( num_col - 1 ) do
        begin
          col_element := j + 1;
          for i := 1 to num_row do
            begin
              gotoxy( ( row + i ), ( col + ( j * 13 ) ) );
              out_real( mat.element[ i, col_element ], 12, as_assigned );
```

FILE: MATRIX.PAS

```
          end;
        end;
      end
    else
      begin
        (* display the first page of a large matrix *)
        make_pretty_large_matrix_one( num_row, num_col );
        for j := 0 to 4 do
          begin
            col_element := j + 1;
            for i := 1 to num_row do
              begin
                gotoxy( ( row + i ), ( col + ( j * 13 ) ) );
                out_real( mat.element[ i, col_element ], 12, as_assigned );
              end;
          end;
        pause;
        clear;
        (* display the second page of a large matrix *)
        make_pretty_large_matrix_two( num_row, num_col );

        for j := 0 to num_col - 6 do
          begin
            col_element := j + 6;
            for i := 1 to num_row do
              begin
                gotoxy( ( row + i ), ( col + ( j * 13 ) ) );
                out_real( mat.element[ i, col_element ], 12, as_assigned );
              end;
          end;
      end;
end;

(*****************************************************************
*                                                                *
*   procedure:     matrx_manipl                                  *
*   version:       1.0                                           *
*   date:          21 September 85                               *
*   description:   This procedure will add, subtract, or multiply two *
*                  matrices.                                     *
*   global variables used:     abort_command                     *
*   passed variables:          first, second, result, mat_obj    *
*   files read:                MATRIX.DAT                        *
*   files written:             MATRIX.DAT                        *
*   procedures called:         trim,         disp_matrx,         *
*                              matrxadd,     mmatrxmlt,          *
*                              matrxsub,     pause               *
*   called by:     mmatrix                                       *
*   author:        Susan K. Mashiko, Capt, USAF                  *


FILE: MATRIX.PAS
*                  Gary C. Tarczynski, Capt, USAF                    *
*                                                                     *
**********************************************************************)

procedure matrx_manipl( var first : cmdword; var second : cmdword;
                        var result : cmdword; var mat_obj : cmdword );

var
  stor_loc  : integer;
  mats      : file of matrix;
  mat1,mat2 : matrix;
  mat3      : matrix;
  i         : integer;

begin
  trim( first );

  if first = 'MATA' then stor_loc := 0
  else
  if first = 'MATB' then stor_loc := 1
  else
  if first = 'MATC' then stor_loc := 2
  else
  if first = 'MATD' then stor_loc := 3
  else
  if first = 'MATE' then stor_loc := 4;

  assign( mats, 'matrix.dat' );
  reset( mats );
  seek( mats, stor_loc);
  read( mats, mat1 );
  close( mats );

  trim( second );
  if second = 'MATA' then stor_loc := 0
  else
  if second = 'MATB' then stor_loc := 1
  else
  if second = 'MATC' then stor_loc := 2
  else
  if second = 'MATD' then stor_loc := 3
  else
  if second = 'MATE' then stor_loc := 4;

  assign( mats, 'matrix.dat' );
  reset( mats );
  seek( mats, stor_loc);
  read( mats, mat2 );
  close( mats );


FILE: MATRIX.PAS
```

```
  if mat_obj = 'ADD' then
    begin
      matrxadd( mat1, mat2, mat3, abort_command );
      if abort_command then exit;
    end
  else
  if mat_obj = 'MATXMULT' then
    begin
      mmatrxmlt( mat1, mat2, mat3, abort_command );
      if abort_command then exit;
    end
  else
  if mat_obj = 'SUBTRACT' then
    begin
      matrxsub( mat1, mat2, mat3, abort_command );
      if abort_command then exit;
    end;

  trim( result );

  if result = 'MATA' then stor_loc := 0
  else
  if result = 'MATB' then stor_loc := 1
  else
  if result = 'MATC' then stor_loc := 2
  else
  if result = 'MATD' then stor_loc := 3
  else
  if result = 'MATE' then stor_loc := 4;

  assign( mats, 'matrix.dat' );
  reset( mats );
  seek( mats, stor_loc);
  write( mats, mat3 );
  close( mats );

  disp_matrx( result );
  pause;

end;

(**********************************************************************
*                                                                     *
*   procedure:    matrx_manip2                                        *
*   version:      1.0                                                 *
*   date:         21 September 85                                     *
*   description:  This procedure will invert, transpose or multiply   *
*                 a matrix by a scaler                                *
*   global variables used:    abort_command                           *


FILE: MATRIX.PAS
*   passed variables:          number, first, result, mat_obj      *
*   files read:                MATRIX.DAT                          *
*   files written:             MATRIX.DAT                          *
*   procedures called:         trim,          disp_matrx,          *
*                              smatrxmlt,     matrxtran,           *
*                              matrxinv,      pause                *
*   called by:      mmatrix                                        *
*   author:         Susan K. Mashiko, Capt, USAF                   *
*                   Gary C. Tarczynski, Capt, USAF                 *
*                                                                  *
*******************************************************************)

procedure matrx_manip2( var number : real; var first : cmdword;
                        var result : cmdword; var mat_obj : cmdword );

var
  stor_loc  : integer;
  mats      : file of matrix;
  mat1,mat2 : matrix;
  i         : integer;

begin
  trim( first );

  if first = 'MATA' then stor_loc := 0
  else
  if first = 'MATB' then stor_loc := 1
  else
  if first = 'MATC' then stor_loc := 2
  else
  if first = 'MATD' then stor_loc := 3
  else
  if first = 'MATE' then stor_loc := 4;

  assign( mats, 'matrix.dat' );
  reset( mats );
  seek( mats, stor_loc);
  read( mats, mat1 );
  close( mats );

  if mat_obj = 'TRANSPOSE' then
    matrxtran( mat1, mat2 )
  else
  if mat_obj = 'INVERSE' then
    begin
      matrxinv( mat1, mat2, abort_command );
      if abort_command then exit;
    end
  else


FILE: MATRIX.PAS
```

```
  if mat_obj = 'SCLRMULT' then
    smatrxmlt( number, mat1, mat2 );

  trim( result );

  if result = 'MATA' then stor_loc := 0
  else
  if result = 'MATB' then stor_loc := 1
  else
  if result = 'MATC' then stor_loc := 2
  else
  if result = 'MATD' then stor_loc := 3
  else
  if result = 'MATE' then stor_loc := 4;

  assign( mats, 'matrix.dat' );
  reset( mats );
  seek( mats, stor_loc);
  write( mats, mat2 );
  close( mats );

  disp_matrx( result );
  pause;

end;

(*****************************************************************************
*                                                                           *
*   procedure:    get_matrx_name                                            *
*   version:      1.0                                                       *
*   date:         20 September 85                                           *
*   description:  This procedure will get the name of a matrix              *
*                 from the screen                                           *
*   global variables used:     abort_command, blanks                        *
*   global variables changed:  blanks                                       *
*   global constants used:     as_assigned, crt_only                        *
*   passed variables:          mat_name, row, col, abort_command            *
*   returned variables:        mat_name                                     *
*   procedures called:         highlight,   nohighlight,                    *
*                              gotoxy,      out_string,                     *
*                              ucase,                                       *
*                              clear_msg,   get_strng,                      *
*                              disp_msg,    pause                           *
*   called by:    mmatrix                                                   *
*   author:       Susan K. Mashiko, Capt, USAF                              *
*                 Gary C. Tarczynski, Capt, USAF                            *
*                                                                           *
*****************************************************************************)


FILE: MATRIX.PAS
```

```
procedure get_matrx_name( var mat_name : msg_line; row : integer;
                          col : integer; abort_command : boolean );

label  again;

begin
  again:
  gotoxy( row, col );
  highlight;
  out_string( copy( blanks, 1, 4), crt_only);
  nohighlight;
  gotoxy( 20,0 );
  out_string( blanks, crt_only );
  gotoxy( 20,10 );
  highlight;
  out_string( ' Your choice... ', as_assigned);
  nohighlight;
  get_strng( mat_name, abort_command, as_assigned, ' ', '~' );
  ucase( mat_name );
  if (( mat_name = 'MATA' ) or ( mat_name = 'MATB' ) or
      ( mat_name = 'MATC' ) or ( mat_name = 'MATD' ) or
      ( mat_name = 'MATE' )) then
      begin
        gotoxy( row,col);
        out_string( mat_name, as_assigned );
      end
  else
      begin
        gotoxy( 18, 5 );
        disp_msg( 9 );
        pause;
        gotoxy( 18, 0 );
        clear_msg( 9 );
        goto again;
      end;
end;

(*********************************************************************
*                                                                    *
*     procedure:    mmatrix                                          *
*     version:      1.0                                              *
*     date:         19 Sep 85                                        *
*     description:  This procedure will decode the command string    *
*                   from procedure define and call the appropriate   *
*                   procedures.                                      *
*     global variables used:      cmdbuffer, abort_command           *
*     global variables changed:   abort_command                      *
*     global constants used:      as_assigned                        *
*     passed variables:           cmdbuffer, wordnumber              *


FILE: MATRIX.PAS
*     procedures called:          trim, clear, disp_matrx, pause,    *
*                                 gotoxy, disp_msg, out_string,      *
*                                 get_matrx_name, matrx_manip1,      *
*                                 matrx_manip2, get_r_num            *
*     called by:  disp                                               *
*     author:     Susan K. Mashiko, Capt, USAF                       *
*                 Gary C. Tarczynski, Capt, USAF                     *
*                                                                    *
**********************************************************************)

procedure mmatrix( var cmdbuffer : buffer;
                   var wordnumber : integer );

var
  mat_obj   : cmdword;
  first     : cmdword;
  second    : cmdword;
  third     : cmdword;
  mat_name  : msg_line;
  number    : real;

begin
  abort_command := false;
  mat_obj := cmdbuffer[ 3 ];
  trim( mat_obj );
  clear;

  (* this is the catch code for the display of a matrix *)
  if ( ( mat_obj = 'MATA' ) or ( mat_obj = 'MATB' ) or ( mat_obj = 'MATC' )
    or ( mat_obj = 'MATD' ) or ( mat_obj = 'MATE' ) ) then
      begin
        disp_matrx( mat_obj );
        pause;
      end
  else
  if ( ( mat_obj = 'ADD' ) or ( mat_obj = 'SUBTRACT' ) or
       ( mat_obj = 'MATXMULT' )  ) then

      begin
        clear;
        gotoxy( 3, 5 );
        disp_msg( 48 );
        gotoxy( 5, 20 );
        out_string( mat_obj, as_assigned );
        gotoxy( 15, 27 );
        out_string( mat_obj, as_assigned );
        gotoxy( 15, 48 );
        out_string( '=', as_assigned );
        get_matrx_name( mat_name, 15, 15, abort_command );


FILE: MATRIX.PAS
```

```
          first := mat_name;
          get_matrx_name( mat_name, 15, 37, abort_command );
          second := mat_name;
          get_matrx_name( mat_name, 15, 52, abort_command );
          third := mat_name;
          matrx_manip1( first, second, third, mat_obj );
        end
    else
    if ( ( mat_obj = 'TRANSPOSE' ) or ( mat_obj = 'INVERSE' ) ) then
        begin
          clear;
          gotoxy( 7, 0 );
          disp_msg( 54 );
          get_matrx_name( mat_name, 13, 35, abort_command );
          first := mat_name;
          get_matrx_name( mat_name, 15, 35, abort_command );
          second := mat_name;
          matrx_manip2( number, first, second, mat_obj );
        end
    else
    if mat_obj = 'SCLRMULT' then
        begin
          clear;
          gotoxy( 5, 0 );
          disp_msg( 55 );
          get_matrx_name( mat_name, 12, 44, abort_command );
          first := mat_name;
          get_r_num( number, 14, 44, abort_command );
          get_matrx_name( mat_name, 16, 44, abort_command );
          second := mat_name;
          matrx_manip2( number, first, second, mat_obj );
        end
    else
    if mat_obj = 'HELP' then
      begin
        clear;
        disp_msg( 49 );
        pause;
        clear;
      end;
  end;
```

FILE: MATRIX.PAS

```
(*****************************************************************
******************************************************************
**                                                              **
**    file:    MATRXMAN.PAS                                     **
**    procedures contained: matrxadd,  mmatrxmlt,   matrxsub    **
**                          smatrxmlt, matrxtran,   matrxinv    **
**    version: 2.0                                              **
**    date:    6 November 85                                    **
**    description:  This file contains the matrix manipulation  **
**                  procedures.                                 **
**    author:  Susan K. Mashiko, Capt, USAF                     **
**             Gary C. Tarczynski, Capt, USAF                   **
**                                                              **
******************************************************************
*****************************************************************)

(*****************************************************************
*                                                                *
*     procedure:    matrxadd                                     *
*     version:      1.0                                          *
*     date:         18 September 85                              *
*     description:  The procedure adds the first two matrices    *
*                   passed to it and places the result in the third. *
*     global variables used:   abort_command                     *
*     global variable changed: abort_command                     *
*     passed variables:        amat, bmat, cmat, abort_command   *
*     returned variables:      cmat, abort_command               *
*     procedures called:       clear,    disp_msg,               *
*                              pause,    gotoxy                  *
*     called by:    matrxsub,   matrx_manipl                     *
*     author:       Susan K. Mashiko, Capt, USAF                 *
*                   Gary C. Tarczynski, Capt, USAF               *
*                                                                *
*****************************************************************)

procedure matrxadd( var amat : matrix;  var bmat : matrix;
                    var cmat : matrix;  var abort_command : boolean );
(* in this procedure the matrix amat and bmat are added *)
(* together to form the third matrix, cmat              *)

var
  i        : integer;
  j        : integer;

begin
  abort_command := false;
  (* check to see if the two matrices may be added together *)
  if ( ( amat.num_rows <> bmat.num_rows ) or
       ( amat.num_cols <> bmat.num_cols ) ) then


FILE: MATRXMAN.PAS
```

```
       begin
         clear;
         gotoxy( 7, 1 );
         disp_msg( 51 );
         pause;
         clear;
         abort_command := true;
         exit;
       end
  else
    (* the dimension of both matrices are the same add the elements *)
    begin
      for j := 1 to amat.num_cols do
        begin
          for i := 1 to amat.num_rows do
              cmat.element[ i, j ] := amat.element[ i, j ] +
                                      bmat.element[ i, j ];

        end;
    end;

    (* store the dimensions of the new matrix *)
    cmat.num_rows := amat.num_rows;
    cmat.num_cols := amat.num_cols;
end;

(*********************************************************************
*                                                                    *
*   procedure:   matrxsub                                            *
*   version:     1.0                                                 *
*   date:        20 September 85                                     *
*   description: This procedure subtracts the second matrix          *
*                passed from the first and places the result into    *
*                the third.                                          *
*   global variables used:    abort_command                          *
*   global variables changed: abort_command                          *
*   passed variables:         amat, bmat, cmat, abort_command        *
*   returned variables:       cmat, abort_command                    *
*   procedures called:        matrxadd                               *
*   called by:                matrx_manipl                           *
*   author:     Susan K. Mashiko, Capt, USAF                         *
*               Gary C. Tarczynski, Capt, USAF                       *
*                                                                    *
*********************************************************************)

procedure matrxsub( var amat : matrix; var bmat : matrix;
                    var cmat : matrix; var abort_command : boolean );

var


FILE: MATRXMAN.PAS
```

```
  i      : integer;
  j      : integer;
  nbmat : matrix;

begin
  abort_command := false;
  (* negate all of the elements of the second matrix *)
  (* then call the matrxadd routine                  *)
  for j := 1 to amat.num_cols do
    begin
      for i := 1 to amat.num_rows do
        nbmat.element[ i, j ] := - bmat.element[ i, j ];
    end;
  nbmat.num_rows := bmat.num_rows;
  nbmat.num_cols := bmat.num_cols;
  matrxadd( amat, nbmat, cmat, abort_command );
  if abort_command then exit;
end;

(*****************************************************************
*                                                                *
*   procedure:     mmatrxmlt                                     *
*   version:       1.0                                           *
*   date:          22 September 85                               *
*   description:   This procedure multiplies the first two matrices *
*                  passed to it and places the result in the     *
*                  third.                                        *
*   global variables used:    abort_command                      *
*   global variables changed: abort_command                      *
*   passed variables:         amat, bmat, cmat, abort_command    *
*   returned variables:       cmat, abort_command                *
*   procedures called:        clear,       gotoxy,     pause,    *
*                             disp_msg                           *
*   called by:                matrx_manipl                       *
*   author:       Susan K. Mashiko, Capt, USAF                   *
*                 Gary C. Tarczynski, Capt, USAF                 *
*                                                                *
*****************************************************************)

procedure mmatrxmlt( var amat : matrix;  var bmat : matrix;
                     var cmat : matrix;  var abort_command : boolean );

var
   i       : integer;
   j       : integer;
   l       : integer;

begin
  abort_command := false;


FILE: MATRXMAN.PAS
```

```
  if amat.num_cols <> bmat.num_rows then
    begin
      clear;
      gotoxy( 7, 0 );
      disp_msg( 52 );
      pause;
      clear;
      abort_command := true;
      exit;
    end
  else
    begin
      for j := 1 to bmat.num_cols do
        begin
          for i := 1 to amat.num_rows do
            begin
              cmat.element[ i, j ] := 0.0;
              for l := 1 to amat.num_cols do
                cmat.element[ i, j ] := cmat.element[ i, j ] +
                      amat.element[ i, l ] * bmat.element[ l, j ];
            end;
        end;
      cmat.num_rows := amat.num_rows;
      cmat.num_cols := bmat.num_cols;
    end;
end;

(*********************************************************************
*                                                                    *
*    procedure:    smatrxmlt                                         *
*    version:      1.0                                               *
*    date:         20 September 85                                   *
*    description:  This procedure multiplies a matrix by a scalar    *
*                  and places the result in the in the second matrix *
*    passed variables:        number, amat, bmat                     *
*    returned variables:      bmat                                   *
*    called by:               matrx_manip2                           *
*    author:      Susan K. Mashiko, Capt, USAF                       *
*                 Gary C. Tarczynski, Capt, USAF                     *
*                                                                    *
*********************************************************************)

procedure smatrxmlt( var number : real; var amat : matrix;
                     var bmat : matrix );

var
  i      : integer;
  j      : integer;



FILE: MATRXMAN.PAS
```

```
begin
  for j := 1 to amat.num_cols do
        begin
          for i := 1 to amat.num_rows do
              bmat.element[ i, j ] :=   amat.element[ i, j ] * number;
        end;
  bmat.num_rows := amat.num_rows;
  bmat.num_cols := amat.num_cols;
end;

(*********************************************************************
*                                                                    *
*    procedure:     matrxtran                                        *
*    version:       1.0                                              *
*    date:          20 September 85                                  *
*    description:   This procedure transposes a matrix and places the *
*                   result in the second matrix                      *
*    passed variables:          amat, bmat                           *
*    returned variables:        bmat                                 *
*    called by:                 matrx_manip2                         *
*    author:      Susan K. Mashiko, Capt, USAF                       *
*                 Gary C. Tarczynski, Capt, USAF                     *
*                                                                    *
*********************************************************************)

procedure matrxtran( var amat : matrix; var bmat : matrix );

var
  i     : integer;
  j     : integer;

begin
   for j := 1 to amat.num_cols do
        begin
          for i := 1 to amat.num_rows do
              bmat.element[ j, i ] :=   amat.element[ i, j ];
        end;
   bmat.num_rows := amat.num_cols;
   bmat.num_cols := amat.num_rows;
end;

(*********************************************************************
*                                                                    *
*    procedure:     matrxinv                                         *
*    version:       2.0                                              *
*    date:          6 November 85                                    *
*    description:   This procedure invert the first matrix and store *
*                   the result in the second.                        *
*    global variables used:     abort_command                        *


FILE: MATRXMAN.PAS
*    global variables changed: abort_command                          *
*    passed variables:         amat, bmat, abort_command              *
*    returned variables:       amat, bmat, abort_command              *
*    procedures called:        clear, gotoxy, disp_msg, pause         *
*    called by:                matrx_manip2                           *
*    author:      Susan K. Mashiko, Capt, USAF                        *
*                 Gary C. Tarczynski, Capt, USAF                      *
*    modification: replaced the algorithm for inverting a matrix      *
*    modified by:  author                                             *
*                                                                     *
***********************************************************************)

procedure matrxinv( var amat : matrix; var bmat : matrix;
                    var abort_command : boolean );

label    single;

var
  dimension    : integer;
  i, j         : integer;
  I1, I2, IP   : integer;
  J1           : integer;
  k            : array[ 1..50 ] of integer;
  p            : array[ 1..50 ] of real;
  PE, TPE      : real;

begin
  abort_command := false;

  (* set up primary counter for inversion *)
  (* NN in fortran code *)
  dimension := amat.num_rows;

  (* test the matrix for singularity *)
  for i := 1 to dimension do
    begin
      if amat.element[ i, i ] = 0 then
        begin
          single:
          clear;
          gotoxy( 7, 1 );
          disp_msg( 56 );
          pause;
          clear;
          abort_command := true;
          exit;
        end;
    end;
```

```
(* the matrix must be square for inversion   *)
(* if it is not square display error message *)
if amat.num_rows <> amat.num_cols then
  begin
    clear;
    gotoxy( 7, 1 );
    disp_msg( 53 );
    pause;
    clear;
    abort_command := true;
    exit;
  end
else
  begin
    for i := 1 to dimension do
      begin
        k[ i ] := i;
        for j := 1 to dimension do
            bmat.element[ i, j ] := amat.element[ i, j ];
      end;

    for i := 1 to dimension do
      begin
        I2 := dimension - i + 1;
        PE := 0.0;
        for I1 := 1 to I2 do
          begin
            TPE := bmat.elament[ I1, 1 ];
            if ( abs(PE)-abs(TPE) ) <= 0 then
              begin
                PE := TPE;
                IP := I1;
              end;
          end;

        if PE <> 0 then
          begin
            for j := 2 to dimension do
              p[ j - 1 ] := bmat.element[ IP, j ]/PE;
            p[ dimension ] := 1.0/PE;
            IP := k[ IP ];
            I2 := 0;
            for j := 1 to dimension do
              begin
                I1 := j - I2;
                k[ I1 ] := k[ j ];
                if ( k[ j ] - IP ) = 0 then
                  I2 := 1
                else
```

FILE: MATRXMAN.PAS

```
                    begin
                      TPE := -bmat.element[ j, 1];
                      for J1 := 2 to dimension do
                        bmat.element[ I1, J1 - 1 ] :=
                           bmat.element[ j, J1 ] + TPE * p[ J1 - 1 ];
                      bmat.element[I1,dimension] := TPE*p[dimension];
                    end;
                end;

              for j := 1 to dimension do
                bmat.element[dimension,j] := p[j];
            end
          else
            goto single;
            k[ dimension ] := IP;
        end;

      for i := 1 to dimension do
        begin
          for j := 1 to dimension do
            begin
              I1 := k[ j ];
              p[ I1 ] := bmat.element[ i,j ];
            end;
          for j := 1 to dimension do
            bmat.element[ i, j ] := p[ j ];
        end;
    end;
  bmat.num_rows := dimension;
  bmat.num_cols := dimension;
end;
```

FILE: MATRXMAN.PAS

```
(****************************************************************
*****************************************************************
**                                                             **
**      file:         MODIFY.PAS                               **
**      procedures contained:   chgmat,   modify               **
**      version:      1.0                                      **
**      date:         22 September 85                          **
**      description:  This file contains the procedures that handle **
**                    the logic to modify or change polynomials and **
**                    matrices.                                **
**      authors:      Susan K. Mashiko, Capt, USAF             **
**                    Gary C. Tarczynski, Capt, USAF           **
**                                                             **
*****************************************************************
****************************************************************)

(****************************************************************
*                                                               *
*       procedure:   chgmat                                     *
*       version:     1.0                                        *
*       date:        22 September 1985                          *
*       description: This procedure will display the requested matrix *
*                    on the screen and ask the user which row and col *
*                    location should be modified and will store the *
*                    result in the original location.           *
*       global variables used:    cmdbuffer, abort_command      *
*       global constants used:    as_assigned, crt_only         *
*       passed variables:         cmdbuffer, wordnumber         *
*       files read:               MATRIX.DAT                    *
*       files written:            MATRIX.DAT                    *
*       procedures called:        trim,         gotoxy,         *
*                                 disp_msg,     out_string,     *
*                                 clear_msg,    out_real,       *
*                                 clear,        pause,          *
*                                 get_r_num,    get_strng,      *
*                                 ucase,        disp_matrx,     *
*                                 get_int,      make_pretty_small_matrix*
*                                 make_pretty_large_matrix_one, *
*                                 make_pretty_large_matrix_two  *
*       called by:  modify                                      *
*       authors:    Susan K. Mashiko, Capt, USAF                *
*                   Gary C. Tarczynski, Capt, USAF              *
*                                                               *
****************************************************************)

overlay procedure chgmat( var cmdbuffer : buffer; wordnumber : integer );

label   second_page,
        again,


FILE: MODIFY.PAS
```

```
        repeat_again,
        first_page_only;

var
  stor_loc    : integer;
  mats        : file of matrix;
  col_element : integer;
  i           : integer;
  j           : integer;
  number      : real;
  mat         : matrix;
  num_row     : integer;
  num_col     : integer;
  chg_row     : integer;
  chg_col     : integer;
  row         : integer;
  col         : integer;
  choice      : cmdword;
  select      : msg_line;
  result      : integer;

begin
  clear;
  choice := cmdbuffer[ 3 ];
  trim( choice );
  (* get the selected matrix from memory *)
  if choice = 'MATA' then stor_loc := 0
  else
  if choice = 'MATB' then stor_loc := 1
  else
  if choice = 'MATC' then stor_loc := 2
  else
  if choice = 'MATD' then stor_loc := 3
  else
  if choice = 'MATE' then stor_loc := 4;

  assign( mats, 'matrix.dat' );
  reset( mats );
  seek( mats, stor_loc);
  read( mats, mat );
  close( mats );

  (* put the title on the screen *)
  clear;
  gotoxy( 1, 32 );
  disp_msg( 50 );
  gotoxy( 2, 37 );
  out_string( choice, as_assigned );
  num_col := mat.num_cols;


FILE: MODIFY.PAS
```

```
num_row := mat.num_rows;
row := 5;
col := 10;

(* if the matrix is small (i.e. 5 columns or less) display *)
(* and change the entry                                    *)
if num_col <= 5 then
  begin
    make_pretty_small_matrix( num_row, num_col );
    for j := 0 to ( num_col - 1 ) do
      begin
        col_element := j + 1;
        for i := 1 to num_row do
          begin
            gotoxy( ( row + i ), ( col + ( j * 13 ) ) );
            out_real( mat.element[ i, col_element ], 12, as_assigned );
          end;
      end;
    (* request the location of the change *)
    gotoxy( 18, 0 );
    disp_msg( 57 );

    (* get the row of the change *)
    repeat
      begin
        gotoxy( 18, 46 );
        out_string('             ', crt_only );
        gotoxy( 18, 46 );
        get_int( chg_row, abort_command );
        if abort_command then exit;
        if ( ( chg_row > mat.num_rows ) or ( chg_row < 1 ) ) then
          begin
            gotoxy( 21, 5 );
            disp_msg( 9 );
            pause;
            gotoxy( 21, 5 );
            clear_msg( 9 );
          end;
      end;
    until ( ( chg_row > 0 ) and ( chg_row <= mat.num_rows ) );

    (* get the column of the change *)
    repeat
      begin
        gotoxy( 19, 46 );
        out_string('             ', crt_only );
        gotoxy( 19, 46 );
        get_int( chg_col, abort_command );
        if abort_command then exit;
```

FILE: MODIFY.PAS

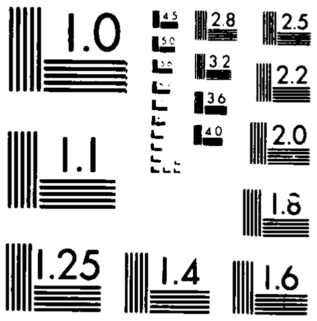
```
        if ( ( chg_col > mat.num_cols ) or ( chg_col < 1 ) ) then
          begin
            gotoxy( 21, 5 );
            disp_msg( 9 );
            pause;
            gotoxy( 21, 5 );
            clear_msg( 9 );
          end;
      end;
    until ( ( chg_col > 0 ) and ( chg_col <= mat.num_cols ) );

    (* ask the user for the new number *)
    get_r_num( number, ( row + chg_row ), ( col + (( chg_col - 1 ) * 13 ) ),
          abort_command );
    (* update the matrix with new entry *)
    mat.element[ chg_row, chg_col ] := number;
  end

else

  (* this is the code for the modification of a large matrix *)
  begin
    (* display the first page of a large matrix *)
    make_pretty_large_matrix_one( num_row, num_col );
    for j := 0 to 4 do
      begin
        col_element := j + 1;
        for i := 1 to num_row do
          begin
            gotoxy( ( row + i ), ( col + ( j * 13 ) ) );
            out_real( mat.element[ i, col_element ], 12, as_assigned );
          end;
      end;
    (* request the location of the change or to proceed to next page *)
    gotoxy( 17, 0 );
    disp_msg( 58 );

    (* get the row of the change or the prompt for next *)
    repeat_again:
      begin
        gotoxy( 18, 46 );
        out_string('            ', crt_only );
        gotoxy( 18, 46 );
        get_strng( select, abort_command, as_assigned, ' ', '~' );
        if abort_command then exit;
        ucase( select );

        if select = 'NEXT' then
          goto second_page
```

FILE: MODIFY.PAS

AD-A164 044 DEVELOPMENT OF A COMPUTER AIDED DESIGN PACKAGE FOR CONTROL SYSTEM DESIGN A..(U) AIR FORCE INST OF TECH WRIGHT-PATTERSON AFB OH SCHOOL OF ENGI..

UNCLASSIFIED S K MASHIKO ET AL. DEC 85 F/G 9/2 NL

4/5


1.0
4.5
5.0
5.6
2.8
2.5
3.2
2.2
3.6
4.0
2.0
1.1
1.8
1.25
1.4
1.6

```
    else
      val( select, chg_row, result );
      if result <> 0 then goto again;
      if ( ( chg_row > mat.num_rows ) or ( chg_row < 1 ) ) then
        begin
          again:
          gotoxy( 21, 5 );
          disp_msg( 9 );
          pause;
          gotoxy( 21, 5 );
          clear_msg( 9 );
          goto repeat_again;
        end;
  end;

(* get the column of the change *)
repeat
  begin
    gotoxy( 19, 46 );
    out_string('              ', crt_only );
    gotoxy( 19, 46 );
    get_int( chg_col, abort_command );
    if abort_command then exit;
    if ( ( chg_col > 5 ) or ( chg_col < 1 ) ) then
      begin
        gotoxy( 21, 5 );
        disp_msg( 9 );
        pause;
        gotoxy( 21, 5 );
        clear_msg( 9 );
      end;
  end;
until ( ( chg_col > 0 ) and ( chg_col <= 5 ) );

(* ask the user for the new number *)
get_r_num( number, ( row + chg_row ), ( col + ( (chg_col - 1 ) * 13 ) ),
         abort_command );
(* update the matrix with new entry *)
mat.element[ chg_row, chg_col ] := number;
goto first_page_only;

second_page:
clear;
(* display the second page of a large matrix *)
make_pretty_large_matrix_two( num_row, num_col );

for j := 0 to num_col - 6 do
  begin
    col_element := j + 6;
```

FILE: MODIFY.PAS

```
    for i := 1 to num_row do
      begin
        gotoxy( ( row + i ), ( col + ( j * 13 ) ) );
        out_real( mat.element[ i, col_element ], 12, as_assigned );
      end;
  end;

(* request the location of the change *)
gotoxy( 18, 0 );
disp_msg( 57 );

(* get the row of the change *)
repeat
  begin
    gotoxy( 18, 46 );
    out_string('              ', crt_only );
    gotoxy( 18, 46 );
    get_int( chg_row, abort_command );
    if abort_command then exit;
    if ( ( chg_row > mat.num_rows ) or ( chg_row < 1 ) ) then
      begin
        gotoxy( 21, 5 );
        disp_msg( 9 );
        pause;
        gotoxy( 21, 5 );
        clear_msg( 9 );
      end;
  end;
until ( ( chg_row > 0 ) and ( chg_row <= mat.num_rows ) );

(* get the column of the change *)
repeat
  begin
    gotoxy( 19, 46 );
    out_string('              ', crt_only );
    gotoxy( 19, 46 );
    get_int( chg_col, abort_command );
    if abort_command then exit;
    if ( ( chg_col > mat.num_cols ) or ( chg_col < 6 ) ) then
      begin
        gotoxy( 21, 5 );
        disp_msg( 9 );
        pause;
        gotoxy( 21, 5 );
        clear_msg( 9 );
      end;
  end;
until ( ( chg_col > 5 ) and ( chg_col <= mat.num_cols ) );
```

FILE: MODIFY.PAS

```
      (* ask the user for the new number *)
      get_r_num( number, ( row + chg_row ), ( col + ( ( chg_col - 6 ) * 13 ) ),
               abort_command );
      (* update the matrix with new entry *)
      mat.element[ chg_row, chg_col ] := number;
    end;

    first_page_only:

    assign( mats, 'matrix.dat' );
    reset( mats );
    seek( mats, stor_loc );
    write( mats, mat );
    close( mats );

    (* display the modified matrix to the user *)
    disp_matrx( choice );
    pause;

end;


(************************************************************************
*                                                                       *
*    procedure:    modify                                               *
*    version:      1.0                                                  *
*    date:         22 September 85                                      *
*    description:  This procedure contains the logic to decide which    *
*                  modifcation procedure should be called and calls it*
*    global variables called:   cmdbuffer                               *
*    passed variables:          cmdbuffer, wordnumber                   *
*    procedures called:         inroot, delroot, chgmat, clear,         *
*                               trim, disp_msg, pause                   *
*    called by:    select                                               *
*    authors:      Susan K. Mashiko, Capt, USAF                         *
*                  Gary C. Tarczynski, Capt, USAF                       *
*                                                                       *
************************************************************************)

procedure modify( var cmdbuffer : buffer;
                  var wordnumber : integer);

var
  mod_obj  : cmdword;

begin
  mod_obj :=  cmdbuffer[ 2 ];
  trim( mod_obj );
  clear;


FILE: MODIFY.PAS
```

```
  if mod_obj = 'ADDROOT' then
      inroot( cmdbuffer, number_of_commands )
  else
  if mod_obj = 'DELROOT' then
      delroot( cmdbuffer, number_of_commands )
  else
  if mod_obj = 'CHANGE' then
      chgmat( cmdbuffer, number_of_commands )
  else
  if mod_obj = 'HELP' then
    begin
      clear;
      disp_msg( 25 );
      pause;
      clear;
    end;
end;
```

FILE: MODIFY.PAS

```
(*****************************************************************
******************************************************************
**                                                              **
**      file:            MSDWCONS.PAS                           **
**      version:         4.0                                    **
**      date:            19 September 85                        **
**      description:     This file contains the constant        **
**                       definitions for the MICROSDW           **
**                       routines.                              **
**      author:          Paul A. Moore, Capt, USAF              **
**      modified by:     Susan K. Mashiko, Capt, USAF           **
**                       Gary C. Tarczynski, Capt, USAF         **
**      mod description:Changed num_words from 75 to 80         **
**      mod date:        8 Aug 85                               **
**      mod description:  Changed num_ptrs from 200 to 250,     **
**                       and changed num_words from 80 to 100.  **
**      mod date:        4 September 1985                       **
**      mod description:  Changed num_ptrs from 250 to 350.     **
**      mod date:        19 September 1985                      **
**                                                              **
******************************************************************
*****************************************************************)

const
   term_length     = 95; { length of array for terminal control data }
   printer_length  = 50; { length of array for printer control data  }
   ff              = 12; { decimal for form feed char                }
   wordlength      =  9; { length of word in storage                 }
   num_param_group =  1;
   num_bools       = 10;
   num_ints        = 10;
   num_reals       = 10;
   num_strings     = 10;
   num_ptr_recs    =  3;
   num_ptrs        =350;
   num_words       =100;
   num_msg_dir     = 70;
   num_msg_line    =250;
   screen_width    = 79;

   ENDCODE         = 9999;
   DONEWORD        = '$$$$$$$$$';
```

FILE: MSDWCONS.PAS

```
(**************************************************************************
***************************************************************************
**                                                                       **
**       file:            MSDWTYPE.PAS                                   **
**       version:         1.2                                            **
**       date:            28 November 84                                 **
**       description:     This file contains the                         **
**                        type definitions for the MICROSDW              **
**                        routines.                                      **
**       author:          Paul A. Moore, Capt, USAF                      **
**                                                                       **
***************************************************************************
***************************************************************************)

type
    ptr_recs    = array[ 1..num_ptr_recs ] of integer;
    paramstring = string[14];

    msg         = record
        loc_rec : integer;
        length  : byte;
        end;

    dict_buffer = record
        ptrs    : array[ 1..num_ptrs ] of ptr_recs;
        words   : array[ 0..num_words ] of string[ wordlength ];
        abbrev  : array[ 0..num_words ] of integer;
       end;

    param_group = record
        bools   : array[ 1..num_bools ] of boolean;
        ints    : array[ 1..num_ints ] of integer;
        reals   : array[ 1..num_reals ] of real;
        strings : array[ 1..num_strings ] of paramstring;
       end;

    msg_dat     = array[1..num_msg_line ] of string[screen_width];

    data        = record
        param   : array[ 1..num_param_group ] of param_group;
        term    : array[ 1..term_length ] of byte;
        printr  : array[ 1..printer_length ] of byte;
        msg_dir : array[ 1..num_msg_dir ] of msg;
        decode_dict : dict_buffer;
       end;

    wordtype    = string[wordlength];


FILE: MSDWTYPE.PAS
```

```
(*********************************************************************
**********************************************************************
**                                                                  **
**      file:              MSG.PAS                                  **
**      procedures contained:   disp_line,                          **
**                              clear_msg,                          **
**                              disp_msg                            **
**      version:           1.5                                      **
**      date:              23 August 85                             **
**      description:       This file contains the procedures to     **
**                         display and clear messages.              **
**      author:            vincent m. parisi ii, capt., usaf        **
**                         Susan K. Mashiko, Capt, USAF             **
**                         Gary C. Tarczynski, Capt, USAF           **
**                                                                  **
**********************************************************************
*********************************************************************)

(*********************************************************************
*                                                                    *
*       procedure:         disp_line                                 *
*       version:           1.2                                       *
*       date:              18 oct 83                                 *
*       description:       This procedure reads one line of text from *
*                          the file HELP.SYS and displays it on the  *
*                          assigned device.                          *
*       global variables used:        msg_txt                        *
*       global constants used:        as_assigned, screen_width      *
*       passed variables:             rec_num                        *
*       files read:                   HELP.SYS                       *
*       procedure called:             out_string                     *
*       called by:                    disp_msg                       *
*       author:            vincent m. parisi ii, capt., usaf         *
*                                                                    *
*********************************************************************)

procedure disp_line( rec_num : integer );

var     print_line      : string[screen_width];

begin
  seek( msg_txt, rec_num );
  read( msg_txt, print_line );
  out_string( print_line, as_assigned );
  writeln;
end;

(*********************************************************************
*                                                                    *
```

FILE: MSG.PAS

```
*       procedure:      clear_msg                                       *
*       version:        1.3                                             *
*       date:           18 oct 83                                       *
*       description:    This procedure clears the message indicated     *
*                       by msg_num, from the screen.  It is the         *
*                       programmer's responsibility to position the     *
*                       cursor prior to calling this routine. The       *
*                       cursor should be placed at the beginning of     *
*                       the line where you wish the message erased.     *
*       global variables used:          msg_dir, blanks                 *
*       global constants used:          crt_only                        *
*       passed variables:               msg_num                         *
*       procedure called:               clear, out_string               *
*       called by:                      disp_msg                        *
*       author:         vincent m. parisi ii, capt., usaf               *
*                                                                       *
*************************************************************************)

procedure clear_msg( msg_num : integer );

var     i        :       integer;
        length   :       integer;

begin

  length := msg_dir[ msg_num ].length;
  if length > 23 then
    clear
  else
    for i := 1 to length do
      begin
        out_string( blanks, crt_only );
        writeln;
      end;
end;

(************************************************************************
*                                                                       *
*       procedure:      disp_msg                                        *
*       version:        3.1                                             *
*       date:           23 Aug 85                                       *
*       description:    This procedure displays the message pointed     *
*                       to by the parameter passed in, msg_num.         *
*                       The message is displayed at the current         *
*                       cursor position.  If the message length is      *
*                       longer than 23 lines, the display stops         *
*                       after showing 22 lines and waits for the        *
*                       user to indicate 'continue' with a <CR>.        *
*                       If a '$' is received, the procedure is          *
```

FILE: MSG.PAS

```
*                    exited and returns to the calling routine.  *
*      global variables used:        msg_dir                      *
*      passed variables:             msg_num                      *
*      procedures called:            disp_line, disp_msg,         *
*                                    gotoxy, clear, clear_msg     *
*      called by:      help, proces_error                         *
*      author:         vincent m. parisi ii, capt., usaf          *
*      modified by:    Susan K. Mashiko, Capt, USAF               *
*                      Gary C. Tarczynski, Capt, USAF             *
*      mod description: Original code used one method for the     *
*                      display of the first and second pages of the *
*                      message and a second method for the re-    *
*                      maining pages.  This mod changed the code so *
*                      that the same method is used for the display *
*                      of all pages.                              *
*      mod date:       23 Aug 85                                  *
*                                                                 *
*******************************************************************)

procedure disp_msg( msg_num : integer );

var     i        :       integer;
        length   :       integer;
        rec_num :        integer;
        remain_lines :   integer;
        resp     :       char;

begin

  length := msg_dir[ msg_num ].length;
  rec_num := msg_dir[ msg_num ].loc_rec - 1;

  if length < 23 then
    for i := 0 to ( length - 1 ) do
      disp_line(( rec_num + i ))
  else
    begin
      remain_lines := length;
      while remain_lines > 21 do
        begin
          clear;
          gotoxy( 0, 0 );
          for i := 0 to 20 do
            disp_line( (rec_num + i) );
          remain_lines := remain_lines - 21;
          rec_num := rec_num + 20;
          gotoxy( 22, 0 );
          disp_msg( 13 );
          read( resp );


FILE: MSG.PAS
```

```
          gotoxy( 22, 0 );
          clear_msg( 13 );
          if resp = '$' then exit;
          gotoxy( 22, 0 );
        end;
      clear;
      for i := 0 to remain_lines do
        disp_line( (rec_num + i ) );     (* records on disk begin at 0 *)
   end;
end;
```

FILE: MSG.PAS

```
(****************************************************************
*****************************************************************
**                                                             **
**      file:                   OUTPUT.PAS                     **
**      procedure contained:    out_string                     **
**      version:                1.0                            **
**      date:                   01 august 1983                 **
**      description:       This module contains the procedure that **
**                         handles all output to the user.     **
**      author:            vincent m. parisi ii, capt., usaf   **
**                                                             **
*****************************************************************
****************************************************************)

(****************************************************************
*                                                               *
*      procedure:       out_string                              *
*      version:         1.0                                     *
*      date:            01 august 1983                          *
*      description:     This procedure handles all string       *
*                       output for the program.  Whenever       *
*                       system output is required, this         *
*                       module is called.  The output is direc- *
*                       ted to the appropriate device.          *
*                       The devices that can accept output are: *
*                         crt-- generally all interaction       *
*                         printer-- for hard copy either dyn-   *
*                              amically or selectively.         *
*                         transaction file--file which contains *
*                              all user interactions for session *
*                              tracing.                         *
*                         temporary file--so user can review    *
*                              work just accomplished.          *
*                       Output can be directed specifically     *
*                       to the crt only, the printer only, both *
*                       or as indicated by the boolean switches *
*                       discussed below.                        *
*      global variables used:  crt, temp, trans, printer, list_dev, *
*                              trans_file, temp_file            *
*      passed variables:       ostring, dest                    *
*      files written:          PRINTER.OUT, TRANSACT.ION, TEMP.OUT *
*      called by:       many                                    *
*      author:          vincent m. parisi ii, capt., usaf       *
*                                                               *
****************************************************************)

procedure out_string( ostring : msg_line;  dest : char );

begin


FILE: OUTPUT.PAS
```

```
  case dest of
        'C', 'c'        :      write( ostring );
        'P', 'p'        :      writeln( list_dev, ostring );
        'B', 'b'        :      begin
                                 write( ostring );
                                 writeln( list_dev, ostring );
                               end;
        'A', 'a'        :      begin
                                if crt then write( ostring );
                                if trans then writeln( trans_file, ostring );
                                if printer then writeln( list_dev, ostring );
                                if temp then writeln( temp_file, ostring );
                               end;
  end;
end;
```

FILE: OUTPUT.PAS

```
(*****************************************************************
******************************************************************
**                                                              **
**      file:           PAUSE.PAS                               **
**      procedure contained: pause                              **
**      version:        1.3                                     **
**      date:           29 October 1984                         **
**      description:    This module contains the procedure      **
**                      that waits for user response to continue **
**                      anytime there is a stop in the program.  **
**      author:         vincent m. parisi ii, capt., usaf       **
**                                                              **
******************************************************************
*****************************************************************)

(*****************************************************************
*                                                                *
*       procedure:      pause                                    *
*       version:        1.1                                      *
*       date:           29 October 1984                          *
*       description:    This procedure waits for user response   *
*                       to continue anytime there is a stop in   *
*                       the program.  If the user has selected   *
*                       the status line on, then it is displayed, *
*                       otherwise it is not.                     *
*       global variables used:  blanks, status_line, stat_on     *
*       global constants used:  screen_width, crt_only,          *
*                               stat_line_width                  *
*       procedures called: gotoxy, highlight, nohighlight,       *
*                          out_string                            *
*       called by:      many                                     *
*       author:         vincent m. parisi ii, capt., usaf        *
*       modifier:       Paul A. Moore, Capt, USAF                *
*                                                                *
*****************************************************************)

procedure pause;

var     resp : char;

begin
  gotoxy( 22, 0);
  out_string(blanks, crt_only);
  gotoxy( 22, 20);
  highlight;
  out_string('   >>>> Press <CR> Key to continue... <<<<   ', crt_only );
  nohighlight;
  read( resp );
  if stat_on then


FILE: PAUSE.PAS
```

```
    begin
      gotoxy(22,0);
      out_string(status_line, crt_only);
    end
  else
    out_string( blanks, crt_only );
end;
```

FILE: PAUSE.PAS

```
(*********************************************************************
**********************************************************************
**                                                                  **
**    file:     POLYMAN.PAS                                         **
**    procedures contained: polyadd,    polymlt,    polysub         **
**                          spolymlt                                **
**    version: 4.0                                                  **
**    date:     7 November 85                                       **
**    description:  This file contains the polynomial manipulation  **
**                  procedures.                                     **
**    author:  Susan K. Mashiko, Capt, USAF                         **
**             Gary C. Tarczynski, Capt, USAF                       **
**                                                                  **
**********************************************************************
*********************************************************************)

(*********************************************************************
*                                                                    *
*     procedure:    polyadd                                          *
*     version:      2.0                                              *
*     date:         18 September 85                                  *
*     description:  The procedure adds the first two polynomials     *
*                   passed to it and places the result in the third. *
*     passed variables: apoly, bpoly, cpoly                          *
*     returned variables:  apoly, bpoly, cpoly                       *
*     procedures called:   roots                                     *
*     called by:         polysub,   polymanip                        *
*     author:  Susan K. Mashiko, Capt, USAF                          *
*              Gary C. Tarczynski, Capt, USAF                        *
*     mod description:  Modified the code to correct coefficient     *
*                       handling.                                    *
*     modified by:      author                                       *
*     mod date:         18 Sep 85                                    *
*                                                                    *
*********************************************************************)

procedure polyadd( var apoly : polynomial;  var bpoly : polynomial;
                   var cpoly : polynomial );
(* in this procedure the polynomials apoly and bpoly are added *)
(* together to form the third polynomial, cpoly                *)

label
  50, 55;

var
  n   :  integer;
  nc  :  integer;
  ncc :  integer;
  i   :  integer;


FILE: POLYMAN.PAS
```

```
nn  :  integer;

 begin
   (* find the degree of cpoly *)
   if apoly.polydeg > bpoly.polydeg then
     cpoly.polydeg := apoly.polydeg;
   if apoly.polydeg <= bpoly.polydeg then
     cpoly.polydeg := bpoly.polydeg;

   (* insure the constant/gain is one *)
   if apoly.coefficient <> 1 then
     for i := 1 to ( apoly.polydeg + 1 ) do
         apoly.polypoly[ i ] := apoly.polypoly[ i ] *
                                apoly.coefficient;
   apoly.coefficient := 1;

   (* insure the constant/gain is one *)
   if bpoly.coefficient <> 1 then
     for i := 1 to ( bpoly.polydeg + 1 ) do
         bpoly.polypoly[ i ] := bpoly.polypoly[ i ] *
                                bpoly.coefficient;
   bpoly.coefficient := 1;


   (* establish counters for do loops *)
   ncc := ( cpoly.polydeg + 1 );
   n := abs( apoly.polydeg - bpoly.polydeg );

   if ( apoly.polydeg - bpoly.polydeg ) < 0 then
     begin
       for i := 1 to n do
         cpoly.polypoly[ i ] := bpoly.polypoly[ i ];
       nn := n + 1;
       for i := nn to ncc do
         cpoly.polypoly[ i ] := bpoly.polypoly[ i ] +
                                apoly.polypoly[( i - n )];
       goto 50
     end
   else
   if ( apoly.polydeg - bpoly.polydeg ) = 0 then
     begin
       for i := 1 to ncc do
         cpoly.polypoly[ i ] := apoly.polypoly[ i ] + bpoly.polypoly[ i ];
       goto 50
     end
   else
   if ( apoly.polydeg - bpoly.polydeg ) > 0 then
     begin
       for i := 1 to n do
```

```
          cpoly.polypoly[ i ] := apoly.polypoly[ i ];
        nn := n + 1;
        for i := nn to ncc do
          cpoly.polypoly[ i ] := apoly.polypoly[ i ] +
                                 bpoly.polypoly[( i - n )];
      end;
 50: if cpoly.polypoly[ 1 ] <> 0 then goto 55;
     nc := nc - 1;
     if nc = 0 then goto 55;
     goto 50;
 55: cpoly.coefficient := cpoly.polypoly[ 1 ];

     (* standardization code for poly storage *)
     if cpoly.polypoly[ 1 ] <> 1 then
       for i := 2 to (cpoly.polydeg + 1) do
          cpoly.polypoly[ i ] := cpoly.polypoly[ i ] /
                                 cpoly.polypoly[ 1 ];
     cpoly.polypoly[ 1 ] := 1;

     roots( cpoly );

   end;
(*******************************************************************
*                                                                  *
*  procedure:    polysub                                           *
*  version:      2.0                                               *
*  date:         7 November 85                                     *
*  description:  This procedure subtracts the second polynomial    *
*                passed from the first and places the result into  *
*                the third.                                        *
*  passed variables:         apoly, bpoly, cpoly                   *
*  procedures called:        polyadd                               *
*  called by:                polymanip                             *
*  author:      Susan K. Mashiko, Capt, USAF                       *
*               Gary C. Tarczynski, Capt, USAF                     *
*  mod description:  added error detection code                    *
*  mod date:   7 Nov 85                                            *
*                                                                  *
*******************************************************************)

procedure polysub( var apoly : polynomial; var bpoly : polynomial;
                   var cpoly : polynomial; var abort_command : boolean );

label  continue;

var
  nbb  : integer;
  i    : integer;


FILE: POLYMAN.PAS
```

```
  nbpoly : polynomial;

begin
  nbb := bpoly.polydeg + 1;
  nbpoly.polydeg := bpoly.polydeg;
  nbpoly.coefficient := - bpoly.coefficient;

  for i := 1 to nbb do
    nbpoly.polypoly[ i ] := bpoly.polypoly[ i ];

  if ( apoly.coefficient = bpoly.coefficient ) and ( apoly.polydeg =
     bpoly.polydeg ) then

     begin
       for i := 1 to apoly.polydeg + 1 do
         if apoly.polypoly[ i ] <> bpoly.polypoly[ i ] then
           goto continue
         else
           begin
             clear;
             gotoxy( 10, 5 );
             writeln( 'ERROR: you may not subtract equal polynomials from');
             gotoxy( 11, 5 );
             writeln( '       one another' );
             pause;
             abort_command := true;
             exit;
           end;
     end;

  continue:
  polyadd( apoly, nbpoly, cpoly );

end;

(*******************************************************************
*                                                                  *
*    procedure:    polymlt                                         *
*    version:      1.0                                             *
*    date:         4 September 85                                  *
*    description:  This procedure multiplies the first two poly-   *
*                  nomials passed to it and places the result in the *
*                  third.                                          *
*    passed variables:       apoly, bpoly, cpoly                   *
*    returned variables:     apoly, bpoly, cpoly                   *
*    procedures used:        clear,       gotoxy,                  *
*                            highlight,   nohighlight,             *
*                            roots                                 *
*    called by:              polymanip                             *
```

FILE: POLYMAN.PAS

```
*    author:       Susan K. Mashiko, Capt, USAF                           *
*                  Gary C. Tarczynski, Capt, USAF                         *
*                                                                         *
***************************************************************************)

procedure polymlt( var apoly : polynomial;  var bpoly : polynomial;
                   var cpoly : polynomial );

var
  i,j    : integer;
  naa    : integer;
  nbb    : integer;

begin
  (* insure the constant/gain is one *)
  if apoly.coefficient <> 1 then
  for i := 1 to ( apoly.polydeg + 1 ) do
    apoly.polypoly[ i ] := apoly.polypoly[ i ] *
                           apoly.coefficient;
  apoly.coefficient := 1;

  (* insure the constant/gain is one *)
  if bpoly.coefficient <> 1 then
  for i := 1 to ( bpoly.polydeg + 1 ) do
    bpoly.polypoly[ i ] := bpoly.polypoly[ i ] *
                           bpoly.coefficient;
  bpoly.coefficient := 1;

  (* check to see if the resulting polynomial will be too large *)
  cpoly.polydeg := apoly.polydeg + bpoly.polydeg;
  if cpoly.polydeg > 10 then
    begin
      clear;
      gotoxy( 8, 0 );
      highlight;
      writeln('     Degree of result greater than 10, option aborted.');
      nohighlight;
      writeln('     Due to the storage space limitations your resulting ');
      writeln('     polynomial is limited to 10 th order');
      exit;
    end
  else
    begin
      for i := 1 to 11 do
       cpoly.polypoly[ i ] := 0.0;
      naa := apoly.polydeg + 1;
      nbb := bpoly.polydeg + 1;
      for i := 1 to naa do
      for j := 1 to nbb do


FILE: POLYMAN.PAS
```

```
      cpoly.polypoly[ i + j - 1] := cpoly.polypoly[ i + j - 1 ] +
         apoly.polypoly[ i ] * bpoly.polypoly[ j ];
    cpoly.coefficient := apoly.coefficient * bpoly.coefficient;
  end;

  cpoly.coefficient := cpoly.polypoly[ 1 ];

  (* standardization code for poly storage *)
  if cpoly.polypoly[ 1 ] <> 1 then
    for i := 2 to (cpoly.polydeg + 1) do
        cpoly.polypoly[ i ] := cpoly.polypoly[ i ] /
                               cpoly.polypoly[ 1 ];
  cpoly.polypoly[ 1 ] := 1;

  roots( cpoly );
end;

(*********************************************************************
*                                                                    *
*   procedure:   spolymlt                                            *
*   version:     1.0                                                 *
*   date:        7 October 85                                        *
*   description: This procedure multiplies the polynomial by the     *
*                scalar (real) value and stores the result in the    *
*                second polynomial                                   *
*   passed variables:         apoly, bpoly, number                   *
*   returned variables:       apoly, bpoly                           *
*   procedures called:        roots                                  *
*   called by:                polymanip,  form                       *
*   author:     Susan K. Mashiko, Capt, USAF                         *
*               Gary C. Tarczynski, Capt, USAF                       *
*                                                                    *
*********************************************************************)

procedure spolymlt( var apoly : polynomial; var bpoly : polynomial;
                    var number : real );

var
  counter  : integer;
  i        : integer;

begin
  counter := apoly.polydeg + 1;
  if apoly.polypoly[ 1 ] <> 1 then
    begin
      for i := 2 to ( apoly.polydeg + 1 ) do
        apoly.polypoly[ i ] := apoly.polypoly[ i ] / apoly.polypoly[ 1 ];
      apoly.polypoly[ 1 ] := 1;
      apoly.coefficient := apoly.coefficient * apoly.polypoly[ 1 ];
    end;
  bpoly.coefficient := apoly.coefficient * number;
  bpoly.polydeg := apoly.polydeg;
  for i := 1 to counter do
    bpoly.polypoly[ i ] := apoly.polypoly[ i ];
  roots( bpoly );
end;
```

```
(*********************************************************************
**********************************************************************
**                                                                  **
**    file:              POLY.PAS                                   **
**    procedures contained:  disppoly,  polymanip,                  **
**                           ppoly,     get_poly_name,              **
**                           polymanip2                             **
**    version:           3.0                                        **
**    date:              8 October 85                               **
**    description:  This file contains the procedures to display    **
**                  and manipulate polynomials.                     **
**    author:       Susan K. Mashiko, Capt, USAF                    **
**                  Gary C. Tarczynski, Capt, USAF                  **
**                                                                  **
**********************************************************************
*********************************************************************)

(*********************************************************************
*                                                                    *
*   procedure:    disppoly                                           *
*   version:      1.0                                                *
*   date:         6 September5                                       *
*   description:  This procedure will display a polynomial from a    *
*                 record in TF&POLS.DAT The user should place a pause*
*                 in his/her code after the calling subroutine to    *
*                 keep the display on the screen.                    *
*   global constants used:      as_assigned                          *
*   passed variables:           choice                               *
*   files read:                 TF&POLS.DAT                          *
*   procedures called:          clear,         gotoxy,               *
*                               out_string,  disp_msg,               *
*                               make_pretty, out_real                *
*                               trim                                 *
*   called by:    polymanip, ppoly, inroot, delroot                  *
*   author:       Susan K. Mashiko, Capt, USAF                       *
*                 Gary C. Tarczynski, Capt, USAF                     *
*                                                                    *
*********************************************************************)

procedure disppoly( var choice : cmdword );

var
  stor_loc    : integer;
  polys       : file of polynomial;
  i           : integer;
  row         : integer;
  number      : real;
  pol         : polynomial;
```

```
begin
  trim( choice );
  if choice = 'POLYA' then stor_loc := 18
  else
  if choice = 'POLYB' then stor_loc := 19
  else
  if choice = 'POLYC' then stor_loc := 20
  else
  if choice = 'POLYD' then stor_loc := 21
  else
  if choice = 'POLYE' then stor_loc := 22
  else
  if choice = 'ONPOLY' then stor_loc := 0
  else
  if choice = 'ODPOLY' then stor_loc := 1
  else
  if choice = 'CNPOLY' then stor_loc := 2
  else
  if choice = 'CDPOLY' then stor_loc := 3
  else
  if choice = 'GNPOLY' then stor_loc := 4
  else
  if choice = 'GDPOLY' then stor_loc := 5
  else
  if choice = 'HNPOLY' then stor_loc := 6
  else
  if choice = 'HDPOLY' then stor_loc := 7;

  assign( polys, 'tf&pols.dat' );
  reset( polys );
  seek( polys, stor_loc);
  read( polys, pol );

  (* put the title on the screen *)
  clear;
  gotoxy( 0,27 );
  disp_msg( 34 );
  gotoxy( 1, 35 );
  out_string( choice, as_assigned );
  gotoxy( 2, 34 );
  row := 3;

  (* draw the form on the screen *)
  make_pretty( row, pol.polydeg );
  i := 1;

  (* get the coefficient and display it *)
  number := pol.coefficient;
  gotoxy(( row + 2 ), 19 );
```

FILE: POLY.PAS

```
  out_real( number, 12, as_assigned );
  gotoxy(( row + 2 ), 57 );
  out_real( number, 12, as_assigned );

  (* display the factored form *)
  while i <= pol.polydeg do
    begin
      gotoxy( ( row + 3 + i ), 43 );
      out_real( pol.polyfact[ i ].realpart, 12, as_assigned);
      gotoxy( ( row + 3 + i ), 59 );
      out_real( pol.polyfact[ i ].imagpart, 12, as_assigned);
      i := i + 1;
    end;

  (* now display the polynomial form *)
  i := 1;
  while i <= ( pol.polydeg + 1 )do
    begin
      gotoxy( ( row + 3 + i ), 7 );
      out_real( pol.polypoly[ i ], 12, as_assigned );
      i := i + 1;
    end;
  end;

(***********************************************************************
*                                                                      *
*   procedure:    polymanip                                            *
*   version:      1.0                                                  *
*   date:         6 September 85                                       *
*   description:  This procedure will add, subtract, or multiply two   *
*                 polynomials.                                         *
*   passed variables:         first, second, result, poly_obj          *
*   files read:               TF&POLS.DAT                              *
*   files written:            TF&POLS.DAT                              *
*   procedures called:        trim,          disppoly,                 *
*                             polyadd,       polymlt,                  *
*                             polysub,       pause                     *
*   called by:    ppoly                                                *
*   author:       Susan K. Mashiko, Capt, USAF                         *
*                 Gary C. Tarczynski, Capt, USAF                       *
*                                                                      *
***********************************************************************)

procedure polmanip( var first : cmdword; var second : cmdword;
                    var result : cmdword; var poly_obj : cmdword );

var
  stor_loc  : integer;
  polys     : file of polynomial;


FILE: POLY.PAS
```

```
  pol1,pol2 : polynomial;
  pol3      : polynomial;
  i         : integer;

begin
  trim( first );

  if first = 'POLYA' then stor_loc := 18
  else
  if first = 'POLYB' then stor_loc := 19
  else
  if first = 'POLYC' then stor_loc := 20
  else
  if first = 'POLYD' then stor_loc := 21
  else
  if first = 'POLYE' then stor_loc := 22
  else
  if first = 'UNPOLY' then stor_loc := 0
  else
  if first = 'ODPOLY' then stor_loc := 1
  else
  if first = 'CNPOLY' then stor_loc := 2
  else
  if first = 'CDPOLY' then stor_loc := 3
  else
  if first = 'GNPOLY' then stor_loc := 4
  else
  if first = 'GDPOLY' then stor_loc := 5
  else
  if first = 'HNPOLY' then stor_loc := 6
  else
  if first = 'HDPOLY' then stor_loc := 7;

  assign( polys, 'tf&pols.dat' );
  reset( polys );
  seek( polys, stor_loc);
  read( polys, pol1 );
  close( polys );

  trim( second );
  if second = 'POLYA' then stor_loc := 18
  else
  if second = 'POLYB' then stor_loc := 19
  else
  if second = 'POLYC' then stor_loc := 20
  else
  if second = 'POLYD' then stor_loc := 21
  else
  if second = 'POLYE' then stor_loc := 22
```

FILE: POLY.PAS

```
else
if second = 'ONPOLY' then stor_loc := 0
else
if second = 'ODPOLY' then stor_loc := 1
else
if second = 'CNPOLY' then stor_loc := 2
else
if second = 'CDPOLY' then stor_loc := 3
else
if second = 'GNPOLY' then stor_loc := 4
else
if second = 'GDPOLY' then stor_loc := 5
else
if second = 'HNPOLY' then stor_loc := 6
else
if second = 'HDPOLY' then stor_loc := 7;

assign( polys, 'tf&pols.dat' );
reset( polys );
seek( polys, stor_loc);
read( polys, pol2 );
close( polys );

if poly_obj = 'ADD' then
  polyadd( pol1, pol2, pol3)
else
if poly_obj = 'POLYMLT' then
  polymlt( pol1, pol2, pol3 )
else
if poly_obj = 'SUBTRACT' then
  begin
    polysub( pol1, pol2, pol3, abort_command );
     if abort_command then exit;
  end;

trim( result );

if result = 'POLYA' then stor_loc := 18
else
if result = 'POLYB' then stor_loc := 19
else
if result = 'POLYC' then stor_loc := 20
else
if result = 'POLYD' then stor_loc := 21
else
if result = 'POLYE' then stor_loc := 22
else
if result = 'ONPOLY' then stor_loc := 0
else
```

FILE: POLY.PAS

```
  if result = 'ODPOLY' then stor_loc := 1
  else
  if result = 'CNPOLY' then stor_loc := 2
  else
  if result = 'CDPOLY' then stor_loc := 3
  else
  if result = 'GNPOLY' then stor_loc := 4
  else
  if result = 'GDPOLY' then stor_loc := 5
  else
  if result = 'HNPOLY' then stor_loc := 6
  else
  if result = 'HDPOLY' then stor_loc := 7;

  assign( polys, 'tf&pols.dat' );
  reset( polys );
  seek( polys, stor_loc);
  write( polys, pol3 );
  close( polys );

  disppoly( result );
  pause;

end;

(*********************************************************************
*                                                                    *
*   procedure:    polymanip2                                         *
*   version:      1.0                                                *
*   date:         8 October 85                                       *
*   description:  This procedure will multiply a polynomial by a     *
*                 scalar, store the result in the desired location,  *
*                 and display the result                             *
*   passed variables:        first, result, number                   *
*   procedures called:       trim, pause, disppoly, spolymlt         *
*   files read:              TF&POLS.DAT                             *
*   files written:           TF&POLS.DAT                             *
*   called by:    ppoly                                              *
*   author:       Susan K. Mashiko, Capt, USAF                       *
*                 Gary C. Tarczynski, Capt, USAF                     *
*                                                                    *
*********************************************************************)

procedure polmanip2( var first : cmdword; var result : cmdword;
                     var number : real );

var
  stor_loc  : integer;
  polys     : file of polynomial;


FILE: POLY.PAS
```

```
  poll,pol2 : polynomial;
  i         : integer;

begin
  trim( first );

  if first = 'POLYA' then stor_loc := 18
  else
  if first = 'POLYB' then stor_loc := 19
  else
  if first = 'POLYC' then stor_loc := 20
  else
  if first = 'POLYD' then stor_loc := 21
  else
  if first = 'POLYE' then stor_loc := 22
  else
  if first = 'ONPOLY' then stor_loc := 0
  else
  if first = 'ODPOLY' then stor_loc := 1
  else
  if first = 'CNPOLY' then stor_loc := 2
  else
  if first = 'CDPOLY' then stor_loc := 3
  else
  if first = 'GNPOLY' then stor_loc := 4
  else
  if first = 'GDPOLY' then stor_loc := 5
  else
  if first = 'HNPOLY' then stor_loc := 6
  else
  if first = 'HDPOLY' then stor_loc := 7;

  assign( polys, 'tf&pols.dat' );
  reset( polys );
  seek( polys, stor_loc);
  read( polys, poll );
  close( polys );

  spolymlt( poll, pol2, number );

  trim( result );

  if result = 'POLYA' then stor_loc := 18
  else
  if result = 'POLYB' then stor_loc := 19
  else
  if result = 'POLYC' then stor_loc := 20
  else
  if result = 'POLYD' then stor_loc := 21
```

FILE: PO[illegible]AS

```
  else
  if result = 'POLYE' then stor_loc := 22
  else
  if result = 'ONPOLY' then stor_loc := 0
  else
  if result = 'ODPOLY' then stor_loc := 1
  else
  if result = 'CNPOLY' then stor_loc := 2
  else
  if result = 'CDPOLY' then stor_loc := 3
  else
  if result = 'GNPOLY' then stor_loc := 4
  else
  if result = 'GDPOLY' then stor_loc := 5
  else
  if result = 'HNPOLY' then stor_loc := 6
  else
  if result = 'HDPOLY' then stor_loc := 7;

  assign( polys, 'tf&pols.dat' );
  reset( polys );
  seek( polys, stor_loc);
  write( polys, pol2 );
  close( polys );

  disppoly( result );
  pause;

end;

(*************************************************************************
*                                                                       *
*  procedure:    get_poly_name                                          *
*  version:      1.0                                                    *
*  date:         6 September 85                                         *
*  description:  This procedure will get the name of a polynomial       *
*                from the screen                                        *
*  global variables used:     abort_command, blanks                     *
*  global constants used:     as_assigned, crt_only                     *
*  passed variables:          poly_name, row, col, abort_command        *
*  procedures called:         highlight, nohighlight, gotoxy,           *
*                             out_string, ucase, trim, pause,           *
*                             get_strng, disp_msg, clear_msg            *
*  called by:    ppoly                                                  *
*  author:       Susan K. Mashiko, Capt, USAF                           *
*                Gary C. Tarczynski, Capt, USAF                         *
*                                                                       *
*************************************************************************)


FILE: POLY.PAS
```

```
procedure get_poly_name( var poly_name : msg_line; row : integer;
                         col : integer; abort_command : boolean );

label  again;

begin
  again:
  gotoxy( row, col );
  highlight;
  out_string( copy( blanks, 1, 5), crt_only);
  nohighlight;
  gotoxy( 20,0 );
  out_string( blanks, crt_only );
  gotoxy( 20,10 );
  highlight;
  out_string( ' Your choice... ', as_assigned);
  nohighlight;
  get_strng( poly_name, abort_command, as_assigned, ' ', '~' );
  ucase( poly_name );
  if (( poly_name = 'POLYA' ) or ( poly_name = 'POLYB' ) or
      ( poly_name = 'POLYC' ) or ( poly_name = 'POLYD' ) or
      ( poly_name = 'POLYE' ) or ( poly_name = 'ONPOLY' ) or
      ( poly_name = 'ODPOLY' ) or ( poly_name = 'CNPOLY' ) or
      ( poly_name = 'CDPOLY' ) or ( poly_name = 'GNPOLY' ) or
      ( poly_name = 'GDPOLY' ) or ( poly_name = 'HNPOLY' ) or
      ( poly_name = 'HDPOLY' )) then
      begin
        gotoxy( row,col);
        out_string( poly_name, as_assigned );
      end
  else
      begin
        gotoxy( 21, 5 );
        disp_msg( 9 );
        pause;
        gotoxy( 21, 0 );
        clear_msg( 9 );
        goto again;
      end;
end;

(**********************************************************************
*                                                                     *
*   procedure:    ppoly                                               *
*   version:      2.0                                                 *
*   date:         19 September 85                                     *
*   description:  This procedure will get the name of a polynomial    *
*                 from the screen                                     *
*   global variables used:     cmdbuffer, abort_command               *


FILE: POLY.PAS
*   global variables changed:  none                                    *
*   global constants used:     as_assigned                             *
*   passed variables:          cmdbuffer, wordnumber                   *
*   procedures called:         clear,        disp_msg,                 *
*                              trim,         disppoly,                 *
*                              gotoxy,       out_string,               *
*                              polymanip,    get_poly_name,            *
*                              get_r_num,    polmanip2,                *
*                              pause                                   *
*   called by:      disp                                               *
*   author:         Susan K. Mashiko, Capt, USAF                       *
*                   Gary C. Tarczynski, Capt, USAF                     *
*   mod description: Added a help option for the DISPLAY POLY and      *
*                      rearranged this menu's call structure           *
*   mod date:  19 September 85                                         *
*                                                                      *
***********************************************************************)

procedure ppoly( var cmdbuffer : buffer;
                 var wordnumber : integer);

var
  poly_obj  : cmdword;
  first     : cmdword;
  second    : cmdword;
  third     : cmdword;
  poly_name : msg_line;
  number    : real;

begin
  poly_obj := cmdbuffer[ 3 ];
  trim( poly_obj );
  clear;

  (* this is the catch code for the display of polynomials *)
  if ( ( poly_obj = 'POLYA' ) or ( poly_obj = 'POLYB' ) or
       ( poly_obj = 'POLYC' ) or ( poly_obj = 'POLYD' ) or
       ( poly_obj = 'POLYE' ) or ( poly_obj = 'ONPOLY' ) or
       ( poly_obj = 'ODPOLY' ) or ( poly_obj = 'CNPOLY' ) or
       ( poly_obj = 'CDPOLY' ) or ( poly_obj = 'GNPOLY' ) or
       ( poly_obj = 'GDPOLY' ) or ( poly_obj = 'HNPOLY' ) or
       ( poly_obj = 'POLY' ) ) then
    begin
      disppoly( poly_obj );
      pause;
    end
  else
  if ( ( poly_obj = 'ADD' ) or ( poly_obj = 'SUBTRACT' )
      or ( poly_obj = 'POLYMLT' ) ) then


FILE: POLY.PAS
```

```
        begin
          clear;
          gotoxy( 3, 5 );
          disp_msg( 35 );
          gotoxy( 5, 20 );
          out_string( poly_obj, as_assigned );
          gotoxy( 15, 27 );
          out_string( poly_obj, as_assigned );
          gotoxy( 15, 48 );
          out_string( '=', as_assigned );
          get_poly_name( poly_name, 15, 15, abort_command );
          first := poly_name;
          get_poly_name( poly_name, 15, 37, abort_command );
          second := poly_name;
          get_poly_name( poly_name, 15, 52, abort_command );
          third := poly_name;
          polmanip( first, second, third, poly_obj );
        end
    else
    if poly_obj = 'SPOLYMLT' then
        begin
          clear;
          gotoxy( 4, 0 );
          disp_msg( 60 );
          get_poly_name( poly_name, 14, 52, abort_command );
          first := poly_name;
          get_r_num( number, 16, 52, abort_command );
          get_poly_name( poly_name, 18, 52, abort_command );
          second := poly_name;
          polmanip2( first, second, number );
        end
    else
    if poly_obj = 'HELP' then
      begin
        clear;
        disp_msg( 21 );
        pause;
        clear;
      end;
  end;
```

FILE: POLY.PAS

```
(******************************************************************
*******************************************************************
**                                                              **
**      file:           PROCESER.PAS                            **
**      procedure contained:  proces_error                      **
**      version:        1.1                                     **
**      date:           16 august 1983                          **
**      description:    This file contains the procedure that   **
**                      handles command decoding errors.  It    **
**                      prompts the user for proper action to   **
**                      take for error correction.              **
**      author:         vincent m. parisi ii, capt., usaf       **
**                                                              **
*******************************************************************
******************************************************************)

(******************************************************************
*                                                                 *
*       procedure:      proces_error                              *
*       version:        1.1                                       *
*       date:           16 august 1983                            *
*       description:    This procedure handles command decoding   *
*                       errors.  It prompts the user for proper   *
*                       action to take for error correction.      *
*       global variables used:  help_level, cmdbuffer             *
*       passed variables:       error_code, level, cmdbuffer,     *
*                               bufferpointer                     *
*       procedures called:      gotoxy,                           *
*                               pause,                            *
*                               displa_commandword,               *
*                               highlight,                        *
*                               nohighlight,                      *
*                               disp_msg                          *
*       called by:              get_cmd                           *
*       author:         vincent m. parisi ii, capt., usaf         *
*                                                                 *
******************************************************************)

procedure proces_error( error_code : char; level : integer;
                        cmdbuffer : buffer; bufferpointer : integer );

var     i       :       integer;

begin
  if help_level > 1 then
    begin
      case error_code of

        'B', 'b'        :       begin


FILE: PROCESER.PAS
```

```
                                          for i := 1 to ( level - 1 ) do
                                            displa_commandword( cmdbuffer, i );
                                          highlight;
                                          displa_commandword( cmdbuffer, level );
                                          nohighlight;
                                          for i := ( level + 1 ) to bufferpointer do
                                            displa_commandword( cmdbuffer, i );
                                        end;
         'C', 'c'         :             begin
                                          highlight;
                                          for i := 1 to ( level - 1 ) do
                                            displa_commandword( cmdbuffer, i );
                                          nohighlight;
                                          for i := level to bufferpointer do
                                            displa_commandword( cmdbuffer, i );
                                        end;
       end;
    end;

   if help_level > 2 then
     begin
       gotoxy( 20, 0 );
       case error_code of

         'B', 'b'         :             begin
                                          disp_msg( 4 );
                                          pause;
                                        end;
         'C', 'c'         :             begin;
                                          disp_msg( 5 );
                                          pause;
                                        end;
       end;
    end;

end;
```

FILE: PROCESER.PAS

```
(*****************************************************************
******************************************************************
**                                                              **
**      file:                     PROMPTCM.PAS                  **
**      procedure contained:    prompt_cmd                      **
**      version:         1.2                                    **
**      date:            30 October 1984                        **
**      description:     This file contains tne procedure that  **
**                       places the command line prompt at the  **
**                       row and column input.                  **
**      author:          vincent m. parisi ii, capt., usaf      **
**                                                              **
******************************************************************
*****************************************************************)

(*****************************************************************
*                                                                *
*       procedure:       prompt_cmd                              *
*       version:         1.2                                     *
*       date:            30 October 1984                         *
*       description:     This procedure places the command line  *
*                        prompt at the row and column input.     *
*       global variables used:  blanks                           *
*       global constants used:  as_assigned, crt_only            *
*       passed variables:       row, col                         *
*       procedures called:      highlight,  gotoxy,  nohighlight,*
*                               out_string                       *
*       called by:       get_cmd                                 *
*       author:          vincent m. parisi ii, capt., usaf       *
*                                                                *
*****************************************************************)

procedure prompt_cmd( row : integer; col : integer );

const   logo = 'Enter Option >';

begin
  gotoxy( row, 0 );
  out_string( blanks, crt_only );
  gotoxy( row, col );
  highlight;
  out_string( logo, as_assigned );
  nohighlight;
end;
```

FILE: PROMPTCM.PAS

```
(****************************************************************
*****************************************************************
**                                                             **
**      file:                   PROMPTHE.PAS                   **
**      procedure contained:    prompt_help                    **
**      version:        2.2                                    **
**      date:           27 September 84                        **
**      description:    This module contains the procedures that **
**                      display acceptable command words based **
**                      upon the words already entered.        **
**      author:         vincent m. parisi ii, capt., usaf      **
**                                                             **
*****************************************************************
****************************************************************)

(****************************************************************
*                                                               *
*       procedure:      prompt_help                             *
*       version:        2.1                                     *
*       date:           20 October 1983                         *
*       description:    This procedure displays the acceptable  *
*                       command words based upon the words      *
*                       already entered.                        *
*       global constants used:  crt_only, ENDCODE, DONEWORD     *
*       passed variables:       rec_num, row                    *
*       returned variables:     rec_num                         *
*       procedures called:      get_line, gotoxy, out_string    *
*                               SVideoLow, SVideoBold           *
*       called by:       get_cmd                                *
*       author:          vincent m. parisi ii, capt., usaf      *
*                                                               *
****************************************************************)

procedure prompt_help( rec_num : integer; row : integer );

const   prompt_col_offset =      5;

var
    row_count  : integer;
    j          : integer;
    decode     : dictionary;
    displayword : msg_line;

begin
  row_count := 0;

  repeat
    gotoxy( ( row + row_count ), prompt_col_offset );
    out_string( '       ', crt_only );


FILE: PROMPTHE.PAS
```

```
    j := 1;
    repeat
        get_line( decode, rec_num );
        if decode.dictword <> DONEWORD then
          begin
            displayword := decode.dictword;
            SVideoLow( displayword, decode.abbrev+1 );
            SVideoBold( displayword, 1 );
            out_string( displayword, crt_only );
            j := j + 1;
          end;
        rec_num := decode.nomatchp;
    until (( j = 6 ) or ( decode.nomatchp = ENDCODE ));

    row_count := row_count + 1;

  until (( row_count = 6 ) or ( decode.nomatchp = ENDCODE ));

end;
```

```
(*****************************************************************
*****************************************************************
**                                                             **
**      file:                    READCOM.PAS                   **
**      procedure contained:     readcom                       **
**      version:                 1.1                           **
**      date:                    28 august 1983                **
**      description:     This module contains the procedure    **
**                       that gets a command line from the user. **
**      author:          vincent m. parisi ii, capt., usaf     **
**                                                             **
*****************************************************************
*****************************************************************)

(*****************************************************************
*                                                               *
*       procedure:      readcom                                 *
*       version:        1.1                                     *
*       date:           28 august 1983                          *
*       description:    Reads command from user and splits it   *
*                       into individual words in the command    *
*                       buffer.                                 *
*       global variables used:  cmdbuffer, abort_command, blanks, *
*                               strng, macro_error              *
*       global variables changed: cmdbuffer, strng              *
*       global constants used:  buffersize, wordsize, terminal_only, *
*                               as_assigned                     *
*       passed variables:       cmdbuffer, bufferpointer,       *
*                               abort_command                   *
*       returned variables:     cmdbuffer, bufferpointer        *
*       procedures called:      get_strng, ucase                *
*       called by:              get_cmd                         *
*       author:         vincent m. parisi ii, capt., usaf       *
*                                                               *
*****************************************************************)

procedure readcom(var cmdbuffer : buffer; var bufferpointer : integer;
                  var abort_command : boolean );

var  i          :       integer;
     j          :       integer;
     tword      :       msg_line;
     lencmd     :       integer;

begin          (*  main body of procedure readcom  *)

  for i := bufferpointer to buffersize do      (* clear cmdbuffer not used to
*)
       cmdbuffer[ i ] := copy( blanks, 1, wordsize );  (*  spaces


FILE: READCOM.PAS
*)

(* get the command from either the macro file or the terminal as assigned
   if there is an error while in macro, then get input from terminal    *)

  if macro_error then
    get_strng( strng, abort_command,  terminal_only, ' ', '~' )
  else
    get_strng( strng, abort_command, as_assigned, ' ', '~' );

  (* if there is no abort command in the string, process the command string.
   * break up the command string into individual words and put each word in
   * the command buffer, left justified with right filled spaces.  return with
   * bufferpointer at next free command buffer position.              *)

  if abort_command = no then
    begin
      ucase ( strng );  (* change entire command to upper case *)
      lencmd := length( strng );

      i := 1;
      repeat
        while ((strng[i] = ' ') and ( i <= lencmd )) do
          i := i + 1;
        if (( strng[i] > ' ') and ( i <= lencmd ))  then
          begin
            j := 0;

            while (( strng[j + i] <> ' ') and ( (i + j) <= lencmd)) do
              j := j + 1;

            tword := copy( strng, i, j );
            tword := concat(tword, '           ');
            cmdbuffer[bufferpointer] := copy(tword,1,12);
            bufferpointer := bufferpointer + 1;
            i := i + j;
          end;

        until i >= lencmd;
      end;

end;                  (*  end of procedure readcom  *)



FILE: READCOM.PAS
```

```
(*******************************************************************
********************************************************************
**                                                                **
**    file:                  reals                                **
**    procedures included:  get_reals,  out_real                  **
**    version:               2.4                                  **
**    date:                  19 August 1985                       **
**    description:  contains the procedures to input and output   **
**                   real numbers.                                **
**    author:       vincent m. parisi, capt, usaf                 **
**                  Susan K. Mashiko, Capt, USAF                  **
**                  Gary C. Tarczynski, Capt, USAF                **
**                                                                **
********************************************************************
*******************************************************************)

(*******************************************************************
*                                                                  *
*     procedure:   out_real                                        *
*     version:     1.4                                             *
*     date:        2 sep 83                                        *
*     description: outputs real numbers to the crt or any of       *
*                  the required files                              *
*     global variables used: crt, trans, printer, temp, list_dev,  *
*                            trans_file                            *
*     global variables changed:  none                              *
*     passed variables:          number, field_width, dest         *
*     files written:             PRINTER.OUT, TRANSACT.ION, TEMP.OUT *
*     called by:   many                                            *
*     author:      vincent m. parisi ii, capt., usaf               *
*                                                                  *
*******************************************************************)

procedure out_real( number : real; field_width : integer; dest : char);

begin
   case dest of
    'C', 'c'      : write( number:field_width );
    'P', 'p'      : writeln( list_dev, number:field_width );
    'B', 'b'      : begin
                     write( number:field_width );
                     writeln( list_dev, number:field_width );
                    end;
    'A', 'a'      : begin
                     if crt then write( number:field_width );
                     if trans then writeln( trans_file, number:field_width );
                     if printer then writeln( list_dev, number:field_width );
                     if temp then writeln( temp_file, number:field_width );
                    end;


FILE: REALS.PAS
```

```
   end;
end;

(****************************************************************************
*                                                                           *
*  procedure:    get_reals                                                  *
*  version:      1.0                                                        *
*  date:         19 August 1985                                             *
*  description:  Handles the input of real numbers. Normal system           *
*                real number input has error checking after the            *
*                <CR> has been entered. This is unsatisfactory              *
*                when using a particular layout on the screen as            *
*                tne error message will more than likely occur at           *
*                an inappropriate place. This routine uses redirect-        *
*                ed IO in that the input is read into a string              *
*                through filters which only accept valid real               *
*                number characters. The string is null or with just         *
*                one space, the operator just entered a <CR> so             *
*                0.0 is returned.                                           *
*   global variables used:     abort_command, strng                        *
*   global variables changed:  strng                                        *
*   global constants used:     as_assigned                                  *
*   passed variables:          number, abort_command                        *
*   procedures called:         get_strng,   gotoxy,    pause,               *
*                              disp_msg,    clear_msg, highlight,           *
*                              out_string,  nohighlight                     *
*   called by:   many                                                       *
*   author:      Susan K. Mashiko, Capt, USAF                               *
*                Gary C. Tarczynski, Capt, USAF                             *
*                                                                           *
****************************************************************************)

procedure get_real( var number : real; var abort_command : boolean );

var       ch     : char;
          result : integer;
          i      : integer;

begin
   strng := '';
   number := 0.00;
   i := 1;

   while i <= 1 do
     begin
       get_strng( strng, abort_command, as_assigned, '0', '9' );
       if abort_command then
         exit;
       val( strng, number, result);


FILE: REALS.PAS
```

```
        if result <> 0 then
          begin
            gotoxy( 20, 5 );
            disp_msg( 9 );
            pause;
            gotoxy( 20, 0 );
            clear_msg( 9 );
            gotoxy( 20, 10 );
            highlight;
            out_string( 'Your number...', as_assigned );
            nohighlight;
          end
          else
            i := i + 1;
    end;  (* end of while loop *)
end;      (* end of procedure  *)
```

FILE: REALS.PAS

```
(**********************************************************************
***********************************************************************
**                                                                   **
**    file:          RECOVER.PAS                                     **
**    procedure contained: recover                                   **
**    version:       2.0                                             **
**    date:          19 Sep 85                                       **
**    description:   This file contains the procedure to copy the    **
**                   user specified files into the ICECAP tf&pols.dat **
**                   file and the matrix.dat file                    **
**    author:        Susan K. Mashiko, Capt, USAF                    **
**                   Gary C. Tarczynski, Capt, USAF                  **
**                                                                   **
***********************************************************************
**********************************************************************)

(**********************************************************************
*                                                                     *
*    procedure:     recover                                           *
*    version:       2.0                                               *
*    date:          19 Sep 85                                         *
*    description:   This file contains the procedure to copy the      *
*                   user specified files into the ICECAP TF&POLS.DAT  *
*                   file and the MATRIX.DAT file                      *
*    global variables used:    abort_command, blanks                  *
*    global constants used:    as_assigned, crt_only                  *
*    files read:               user specified transfer function file  *
*                              and matrix file                        *
*    files written:            TF&POLS.DAT, MATRIX.DAT                *
*    procedures called:        clear,    gotoxy,                      *
*                              disp_msg, get_strng,                   *
*                              pause,    clear_msg                    *
*                              out_string                             *
*    called by:     select                                            *
*    author:        Susan K. Mashiko, Capt, USAF                      *
*                   Gary C. Tarczynski, Capt, USAF                    *
*    mod description: Code was added to limit the length of the file  *
*                       name.                                         *
*    modifier:      Author                                            *
*    mod date:      19 Sep 85                                         *
*                                                                     *
**********************************************************************)

overlay procedure recover;

label
  repeat1,
  repeat2;


FILE: RECOVER.PAS
```

```
var
  polys     : file of polynomial;
  polya     : file of polynomial;
  pol       : polynomial;
  i         : integer;
  your_name : msg_line;
  mats      : file of matrix;
  mata      : file of matrix;
  mat       : matrix;

begin
  clear;

  (* copy user file into tf&polys.dat *)
  repeat1:
  gotoxy( 4, 0 );
  disp_msg( 38 );
  gotoxy( 10, 24 );

  (* get the user specified file name from the user *)
  get_strng( your_name, abort_command, as_assigned, ' ', '~');
  if abort_command then exit;
  if length( your_name ) > 8 then
    begin
      gotoxy( 20, 10 );
      disp_msg( 44 );
      pause;
      clear_msg( 44 );
      gotoxy( 10, 0 );
      out_string( blanks, crt_only );
      goto repeat1;
    end;

  assign( polys, 'tf&pols.dat' );
  rewrite( polys );

  assign( polya, your_name );
  reset( polya );

  for i := 0 to 22 do
    begin
      seek( polya, i );
      read( polya, pol );
      seek( polys, i );
      write(polys, pol );
    end;
  close( polys );
  close( polya );
```

FILE: RECOVER.PAS

```
 (* copy user file into matrix.dat *)
 repeat2:
 gotoxy( 12, 0 );
 disp_msg( 39 );
 gotoxy( 18, 24 );

 (* get the user specified file name from the user *)
 get_strng( your_name, abort_command, as_assigned, ' ', '~');
 if abort_command then exit;
 if length( your_name ) > 8 then
   begin
     gotoxy( 20, 10 );
     disp_msg( 44 );
     pause;
     clear_msg( 44 );
     gotoxy( 18, 0 );
     out_string( blanks, crt_only );
     goto repeat2;
   end;

 assign( mats, 'matrix.dat' );
 rewrite( mats );

 assign( mata, your_name );
 reset( mata );

 for i := 0 to 4 do
   begin
     seek( mata, i );
     read( mata, mat );
     seek( mats, i );
     write(mats, mat );
   end;
 close( mats );
 close( mata );

end;
```

FILE: RECOVER.PAS

```
(*****************************************************************
******************************************************************
**                                                              **
**      file:                       SELECT.PAS                  **
**      procedure contained:        select_routine              **
**      version:                    5.0                         **
**      date:                       4 September 85              **
**      description:        This module contains the procedure that **
**                          receives the name of the routine to call **
**                          and calls it.                       **
**      author:             Paul A. Moore, Capt, USAF           **
**                          Susan K. Mashiko, Capt, USAF        **
**                          Gary C. Tarczynski, Capt, USAF      **
**                                                              **
******************************************************************
*****************************************************************)

(*****************************************************************
*                                                                *
*      procedure                   select_routine                *
*      version:                    6.0                           *
*      date:                       11 October 85                 *
*      description:        This procedure receives the name of the *
*                          routine to call and calls it.         *
*      global variables used:      call_routine, cmdbuffer,      *
*                                  number_of_commands            *
*      global variables changed:   call_routine                  *
*      passed variables:           call_routine, cmdbuffer,      *
*                                  number_of_commands            *
*      returned variables:         call_routine                  *
*      procedures called:  trim, define, help, disp, ccopyy,     *
*                          modify, pause, recover, update, form, *
*                          frequency_response                    *
*      called by:          ICECAPPC                              *
*      author:             Paul A. Moore, Capt, USAF             *
*      modified by:        Susan K. Mashiko, Capt, USAF          *
*                          Gary C. Tarczynski, Capt, USAF        *
*      mod description:    Changes were made to call the major   *
*                          subroutines in ICECAPPC.              *
*      mod date:           11 October 85                         *
*                                                                *
*****************************************************************)

procedure select_routine( var call_routine : cmdword;
                          var cmdbuffer : buffer ;
                              number_of_commands : integer );
var i          : integer;
    copy       : file;


FILE: SELECT.PAS
```

```
begin
    trim( call_routine );

    if call_routine <> 'STOP' then
       begin

          if call_routine = 'DEFINE' then       (* added 12 Aug 85 *)
             define( cmdbuffer, number_of_commands )
          else
          if call_routine = 'HELP' then
             help( cmdbuffer, number_of_commands )
          else
          if call_routine = 'DISPLAY' then      (* added 4 Sep 85 *)
             disp( cmdbuffer, number_of_commands )
          else
          if call_routine = 'COPY' then         (* added 4 Sep 85 *)
             ccopyy( cmdbuffer )
          else
          if call_routine = 'MODIFY' then
             modify( cmdbuffer, number_of_commands ) (* added 22 Sep 85 *)
          else
          if call_routine = 'RECOVER' then
             recover                                 (* added 9 Sep 85 *)
          else
          if call_routine = 'UPDATE' then
             update                                   (* added 9 Sep 85 *)
          else
          if call_routine = 'FORM' then
             form
          else
          if call_routine = 'FREQ/RESP' then
             frequency_response                       (* added 11 Oct 85 *)
    else
       begin
             (* Print out command buffer and call routine name *)
              writeln;
              writeln('SELECT: ',call_routine);
              i := 1;
              while (cmdbuffer[i] <> '             ') and (i<=buffersize) do
                 begin
                    write(cmdbuffer[i]);
                    i := i + 1;
                 end;
              pause;
       end;
     end;
 end;


FILE: SELECT.PAS
```

```
(*************************************************************
**************************************************************
**                                                          **
**      file:               STDOUT.PAS    *** IBM ONLY ***  **
**      procedure contained: standard_output                **
**      version:            1.0                             **
**      date:               03 August 1985                  **
**      description:        This file contains the procedure for   **
**                          redirecting the output from TURBO Pascal **
**                          so the IBM PC can recognize escape codes. **
**      author:             Gary C. Tarczynski, Capt, USAF  **
**                          Susan K. Mashiko, Capt, USAF    **
**                                                          **
**************************************************************
*************************************************************)

(*************************************************************
*                                                            *
*       procedure:          standard_output                  *
*       version:            1.0                              *
*       date:               03 August 1985                   *
*       description:        This procedure redirects TURBO Pascal *
*                           output from the basic input/output *
*                           system (BIOS) to the operating system *
*                           (MS-DOS).  This allows the IBM PC to *
*                           recognize escape codes.          *
*       passed variables: c                                  *
*       called by:          Any WRITE or WRITELN statement.  By *
*                           setting ConOutPtr:=Ofs(standard_ *
*                           output) in the program MICROSDW, then *
*                           the address of this procedure is put *
*                           into the pointer ConOutPtr.  This *
*                           pointer is used by WRITE and WRITELN *
*                           statements to locate code for output *
*                           to the terminal.  Hence this proce- *
*                           dure reroutes the WRITE and WRITELN *
*                           statements to MS-DOS.            *
*       author:             Gary C. Tarczynski, Capt, USAF   *
*                           Susan K. Mashiko, Capt, USAF     *
*                                                            *
*************************************************************)

procedure standard_output(c: char);

  var
    r     :     regpak;

  begin
    r.ah := 2;     (* DOS function call to output to the display *)
    r.dl := ord(c);     (* Character in dl is sent to the display *)
    msdos(r);
  end;
```

```
(******************************************************************
*******************************************************************
**                                                              **
**      file:                   TERMINAL.PAS                    **
**      procedures contained:   clear, gotoxy, highlight,       **
**                              nohighlight, graphics, nographics, **
**                              VideoLow, SVideoLow, VideoBold, **
**                              SVideoBold, ClearScreen         **
**      version:                3.0                             **
**      date:                   12 Dec 84                       **
**      description:    This file contains the procedures that  **
**                      interface with the terminal.            **
**      global variables used:          term,                   **
**                                      stat_on,                **
**                                      stat_line               **
**      global constants used:          term_length,            **
**                                      stat_line_width         **
**      author:         vincent m. parisi ii, capt., usaf       **
**                                                              **
*******************************************************************
******************************************************************)

(******************************************************************
*                                                                 *
*       procedure:              graphics                          *
*       version:                2.0                               *
*       date:                   21 oct 83                         *
*       description:    This procedure places the terminal in     *
*                       graphics mode.                            *
*       global variables used:          term                      *
*       global constants used:          term_length               *
*       procedures called:              none                      *
*       called by:                      many                      *
*       author:         vincent m. parisi ii, capt., usaf         *
*                                                                 *
******************************************************************)

procedure graphics;

var     i       :       integer;

begin
  for i := 41 to ( term[ 40 ] + 40 ) do
      write( chr( term[ i ] ) );
end;

(******************************************************************
*                                                                 *
*       procedure:              nographics                        *
*       version:                2.0                                    *
*       date:                   21 oct 83                              *
*       description:            This procedure removes the terminal   *
*                               from graphics mode.                    *
*       global variables used:          term                           *
*       global constants used:          term_length                    *
*       procedures called:              none                           *
*       called by:                      many                           *
*       author:         vincent m. parisi ii, capt., usaf              *
*                                                                      *
***********************************************************************)

procedure nographics;
var     i       :       integer;

begin
for i := 48 to ( term[ 47 ] + 47 ) do
   write( chr( term[ i ] ) );
end;

(**********************************************************************
*                                                                      *
*       procedure:              highlight                              *
*       version:                2.0                                    *
*       date:                   21 oct 83                              *
*       description:    This procedure puts the screen in reverse     *
*                       video.                                         *
*       global variables used:          term                           *
*       global constants used:          term_length                    *
*       procedures called:              none                           *
*       called by:                      many                           *
*       author:         vincent m. parisi ii, capt., usaf              *
*                                                                      *
***********************************************************************)

procedure highlight;

var i   :       integer;

begin
  for i := 28 to ( term[ 27 ] + 27 ) do
    write( chr( term[ i ] ) );
end;

(**********************************************************************
*                                                                      *
*       procedure:              nohighlight                            *
*       version:                2.0                                    *
*       date:                   21 oct 83                              *
```

FILE: TERMINAL.PAS

```
*       description:    This procedure takes the screen out of          *
*                       reverse video.                                  *
*       global variables used:          term                            *
*       global constants used:          term_length                     *
*       procedures called:              none                            *
*       called by:                      many                            *
*       author:         vincent m. parisi ii, capt., usaf               *
*                                                                       *
*************************************************************************)

procedure nohighlight;

var     i       :       integer;

begin
  for i := 35 to ( term[ 34 ] + 34 ) do
    write( chr( term[ i ] ) );
end;

(************************************************************************
*                                                                       *
*       procedure:              gotoxy                                  *
*       version:                2.0                                     *
*       date:                   21 oct 83                               *
*       description:    This procedure places the cursor at the x       *
*                       and y coordinates passed to it.  It is          *
*                       capable of sending an initial string of         *
*                       characters, either the row or column            *
*                       (whichever is required first), then an          *
*                       intermediate string of characters, the          *
*                       other address, and finally a trailing string    *
*                       of characters if required.  Offsets if any      *
*                       are added prior to sending the row/column.      *
*       global variables used:          term                            *
*       global constants used:          term_length                     *
*       passed variables:               row, col                        *
*       returned variables:             row, col                        *
*       procedures called:              none                            *
*       called by:                      many                            *
*       author:         vincent m. parisi ii, capt., usaf               *
*       modifier:       Paul A. Moore, CAPT, USAF                       *
*       mod description: Modified to allow different terminal types.    *
*                       H19/29 = 0, VT100 = 1                           *
*                                                                       *
*************************************************************************)

procedure gotoxy( row : integer; col : integer );

var     i       :       integer;


FILE: TERMINAL.PAS
```

```
  procedure ttype(switch:integer; wchar : integer); (* terminal type *)
    begin
     if switch = 0 then
       write ( chr(wchar) )     (* H19/29 terminal  *)
     else
       write( wchar )           (* VT100 terminal   *)
    end;

begin

  row := row + term[ 7 ];               (* add row and col offsets      *)
  col := col + term[ 8 ];

  (* send out initial string    *)
  for i := 2 to ( term[ 1 ] + 1 ) do
    write( chr( term[ i ] ) );

  if term[ 9 ] = 0 then         (* if = 0 then row goes first, else     *)
    ttype(term[90],row)
  else
    ttype(term[90],col);

  (* send out intermediate  *)
  for i := 11 to ( term[ 10 ] + 10 ) do
    write( chr( term[ i ] ) );          (* string if any  *)

  if term[ 9 ] = 0 then                 (* send out remaining row or col *)
    ttype(term[90],col)
  else
    ttype(term[90],row);

(* now send out ending string if any *)
  for i := 15 to ( term[ 14 ] + 14 ) do
    write( chr( term[ i ] ) );
end;

(*********************************************************************
*                                                                    *
*       procedure:              clear                                *
*       version:                2.0                                  *
*       date:                   21 oct 83                            *
*       description:    This procedure clears the screen and homes   *
*                       the cursor.  If status line is visible       *
*                       (stat_on = true) then the status line is     *
*                       displayed.                                   *
*       global variables used:  term, stat_on, stat_line             *
*       global constants used:                                       *
*       procedures called:      gotoxy                               *
*       called by:              many                                 *
```

FILE: TERMINAL.PAS

```
*       author:         vincent m. parisi ii, capt., usaf                  *
*                                                                          *
****************************************************************************)

procedure clear;

var i : integer;

begin
  for i := 1 to term[ 19 ] do
    write( chr( term[ 19 + i ] ) );

  if stat_on then
    begin
      gotoxy( 22,0 );
      write( status_line );
      gotoxy( 0, 0 );
    end;
end;

(***************************************************************************
*                                                                          *
*       procedure:      ClearScreen                                        *
*       version:                1.0                                        *
*       date:                   12 Dec 84                                  *
*       description:    This procedure clears the screen and homes         *
*                       the cursor.                                        *
*       global variables used:          term, stat_on, stat_line           *
*       global constants used:          term_length,                       *
*                                       stat_line_width                    *
*       procedures called:              none                               *
*       called by:                      many                               *
*       author:         Paul A. Moore, Capt, USAF                          *
*                                                                          *
****************************************************************************)

procedure ClearScreen;

var  i : integer;

begin
  for i := 1 to term[ 19 ] do
    write( chr( term[ 19 + i ] ) );
end;

(***************************************************************************
*                                                                          *
*       procedure:              VideoLow                                   *
*       version:                1.0                                        *
```

FILE: TERMINAL.PAS

```
*       date:                   27 Sep 84                              *
*       description:  This procedure puts the screen into low video.  *
*       global variables used:          term                           *
*       global constants used:          term_length                    *
*       procedures called:              none                           *
*       called by:                      many                           *
*       author:         Paul A. Moore, capt., usaf                     *
*                                                                      *
************************************************************************)

procedure VideoLow;

var     i       :       integer;

begin
  for i := 71 to ( term[ 70 ] + 70 ) do
    write( chr( term[ i ] ) );
end;

(***********************************************************************
*                                                                      *
*       procedure:              SVideoLow                              *
*       version:                1.0                                    *
*       date:                   27 Sep 84                              *
*       description: This procedure inserts the character string to   *
*                    put the screen into low video into the input     *
*                    string at the given position.  It then returns   *
*                    the modified string.                              *
*       global variables used:          term                           *
*       global constants used:          term_length                    *
*       passed variables:               Instring, pos                  *
*       procedures called:              none                           *
*       called by:                      many                           *
*       author:         Paul A. Moore, capt., usaf                     *
*                                                                      *
************************************************************************)

procedure SVideoLow(var Instring : msg_line; pos : integer );

var i    :       integer;
    tempstr : string[10];

begin
  tempstr := '';     (* null string *)
  for i := 71 to ( term[ 70 ] + 70 ) do
    tempstr := concat(tempstr, chr(term[i]) );
  Insert(tempstr,Instring,pos);
end;



FILE: TERMINAL.PAS
```

```
(*****************************************************************
*                                                                *
*       procedure:              VideoBold                        *
*       version:                1.0                              *
*       date:                   27 Sep 84                        *
*       description:  This procedure writes the character string *
*                     to put the screen into bold video.         *
*       global variables used:          term                     *
*       global constants used:          term_length              *
*       procedures called:              none                     *
*       called by:                      many                     *
*       author:         Paul A. Moore, capt., usaf               *
*                                                                *
*****************************************************************)

procedure VideoBold;

var i   :       integer;

begin
  for i := 77 to ( term[ 76 ] + 76 ) do
    write( chr(term[i]) );
end;

(*****************************************************************
*                                                                *
*       procedure:              SVideoBold                       *
*       version:                1.0                              *
*       date:                   27 Sep 84                        *
*       description:  This procedure inserts the character string *
*                     to put the screen into bold video into the *
*                     input string at the given position.  It then *
*                     returns the modified string.               *
*       global variables used:          term                     *
*       global constants used:          term_length              *
*       passed variables:               Instring, pos            *
*       procedures called:              none                     *
*       called by:                      many                     *
*       author:         Paul A. Moore, capt., usaf               *
*                                                                *
*****************************************************************)

procedure SVideoBold(var Instring : msg_line; pos : integer );

var i   :       integer;
    tempstr : string[10];

begin
  tempstr := '';      (* null string *)


FILE: TERMINAL.PAS
```

```
  for i := 77 to ( term[ 76 ] + 76 ) do
    tempstr := concat(tempstr, chr(term[i]) );
  Insert(tempstr,Instring,pos);
end;

(*********************************************************************
*                                                                    *
*       procedure:              Rectangle                            *
*       version:                1.0                                  *
*       date:                   27 Sep 84                            *
*       description:  This procedure draws a rectangle of the given  *
*                     dimensions on the video screen.                *
*       global variables used:  term                                 *
*       global constants used:  term_length                          *
*       passed variables:       line, column, width, height          *
*       procedures called:      graphics, gotoxy, nographics         *
*       called by:              many                                 *
*       author:         Paul A. Moore, capt., usaf                   *
*                                                                    *
*********************************************************************)

procedure Rectangle(line,column,width,height : integer);

var
    i, L1, C1 : integer;

begin
    graphics;
    L1  := line + height - 1;
    C1  := column + width - 1;

    gotoxy(line,column);         (* upper left corner of Rectangle  *)
    write(chr(term[64]));        (* upper left corner               *)
    for i := column+1 to C1-1 do         (* top of Rectangle        *)
        write(chr(term[55]));
    write(chr(term[61]));        (* upper right corner              *)

    (* columns of Rectangle *)
    for i := line+1 to L1-1 do
      begin
        gotoxy(i,column);  write(chr(term[54]));
        gotoxy(i,C1);      write(chr(term[54]));
      end;

    gotoxy(L1,column);           (* lower left corner of Rectangle  *)
    write(chr(term[63]));        (* lower left corner               *)
    for i := column+1 to C1-1 do         (* bottom of Rectangle     *)
        write(chr(term[55]));
    write(chr(term[62]));        (* lower right corner              *)


FILE: TERMINAL.PAS
```

```
    nographics;
end;
```

```
(*********************************************************************
**********************************************************************
**                                                                  **
**      file:             TRIM.PAS                                  **
**      procedures contained:   trim                                **
**      version:          1.1                                       **
**      date:             30 June 1984                              **
**      description:      This file contains the procedure to       **
**                        trim trailing blanks from command         **
**                        words.                                    **
**      author:           vincent m. parisi ii, capt., usaf         **
**                                                                  **
**********************************************************************
*********************************************************************)

(*********************************************************************
*                                                                    *
*       procedure:        trim                                       *
*       version:          1.1                                        *
*       date:             30 June 1984                               *
*       description:      This procedure trims trailing blanks       *
*                         from command word strings.                 *
*       global constants used:  wordsize                             *
*       passed variables:       cmdword                              *
*       returned variables:     cmdword                              *
*       called by:        displayc                                   *
*       author:           vincent m. parisi ii, capt., usaf          *
*       modifier:         Paul A. Moore, Capt, USAF                  *
*                                                                    *
*********************************************************************)

procedure trim( var cmdword : cmdword );

var     i       :       integer;

begin

  i := length(cmdword);
  while (cmdword[i] = ' ') do
    i := i - 1;
  cmdword := copy(cmdword,1,i);

end;
```

FILE: TRIM.PAS

```
(*********************************************************************
*********************************************************************
**                                                                 **
**       file:                   UCASE.PAS                         **
**       procedure contained:    ucase                             **
**       version:                1.1                               **
**       date:                   28 august 1983                    **
**       description:  This module contains the procedure          **
**                     to convert lower case strings to upper.     **
**       author:       vincent m. parisi ii, capt., usaf           **
**                                                                 **
*********************************************************************
*********************************************************************)

(*********************************************************************
*                                                                   *
*       procedure:      ucase                                       *
*       version:        1.1                                         *
*       date:           28 august 1983                              *
*       description:    Converts lower case strings to upper.       *
*       passed variables          instring                          *
*       returned variables:       instring                          *
*       called by:                readcom                           *
*       author:         vincent m. parisi ii, capt., usaf           *
*                                                                   *
*********************************************************************)

procedure ucase( var instring : msg_line);

var  i          :       integer;

begin

  for i := 1 to length(instring) do
        instring[i] := UpCase(instring[i]);

end;
```

FILE: UCASE.PAS

```
(**********************************************************************
***********************************************************************
**                                                                   **
**   file:          UPDATE.PAS                                       **
**   procedure contained: update                                     **
**   version:       2.0                                              **
**   date:          19 Sep 85                                        **
**   description:   This file contains the procedure to copy the     **
**                  ICECAP tf&pols.dat file and the matrix.dat file  **
**                  into user specified files.                       **
**   author:        Susan K. Mashiko, Capt, USAF                     **
**                  Gary C. Tarczynski, Capt, USAF                   **
**                                                                   **
***********************************************************************
**********************************************************************)

(**********************************************************************
*                                                                     *
*    procedure:     update                                            *
*    version:       2.0                                               *
*    date:          19 Sep 85                                         *
*    description:   This file contains the procedure to copy the      *
*                   ICECAP TF&POLS.DAT file and the MATRIX.DAT file   *
*                   into user specified files.                        *
*    global variables used:    abort_command, blanks                  *
*    global constants used:    as_assigned, crt_only                  *
*    files created:            user specified transfer function file  *
*                              and matrix file                        *
*    files written:            same as files created                  *
*    files read:               TF&POLS.DAT, MATRIX.DAT                *
*    procedures called:        clear,     gotoxy,                     *
*                              disp_msg, get_strng,                   *
*                              pause,     clear_msg                   *
*                              out_string                             *
*    called by:    select                                             *
*    author:       Susan K. Mashiko, Capt, USAF                       *
*                  Gary C. Tarczynski, Capt, USAF                     *
*    mod description: Code was added to limit the length of the file  *
*                        name.                                        *
*    modifier:     Author                                             *
*    mod date:     19 Sep 85                                          *
*                                                                     *
**********************************************************************)

overlay procedure update;

label
  repeat1,
  repeat2;


FILE: UPDATE.PAS
```

```
var
  polys     : file of polynomial;
  polya     : file of polynomial;
  pol       : polynomial;
  i         : integer;
  your_name : msg_line;
  mats      : file of matrix;
  mata      : file of matrix;
  mat       : matrix;

begin
  clear;
  (* update user file with tf&pols.dat *)
  repeat1:
  gotoxy( 4, 0 );
  disp_msg( 36 );
  gotoxy( 10, 25 );

  (* get the user specified file name form the user *)
  get_strng( your_name, abort_command, as_assigned, ' ', '~');
  if abort_command then exit;
  if length( your_name ) > 8 then
    begin
      gotoxy( 20, 10 );
      disp_msg( 44 );
      pause;
      clear_msg( 44 );
      gotoxy( 10, 0 );
      out_string( blanks, crt_only );
      goto repeat1;
    end;

  assign( polys, 'tf&pols.dat' );
  reset( polys );

  assign( polya, your_name );
  rewrite( polya );

  for i := 0 to 22 do
    begin
      seek( polys, i );
      read( polys, pol );
      seek( polya, i );
      write(polya, pol );
    end;
  close( polys );
  close( polya );

  (* now update user file with matrix.dat *)


FILE: UPDATE.PAS
```

```
  repeat2:
  gotoxy( 12, 0 );
  disp_msg( 37 );
  gotoxy( 18, 25 );

  (* get the user specified file name from the user *)
  get_strng( your_name, abort_command, as_assigned, ' ', '~');
  if abort_command then exit;
  if length( your_name ) > 8 then
    begin
      gotoxy( 20, 10 );
      disp_msg( 44 );
      pause;
      clear_msg( 44 );
      gotoxy( 18, 0 );
      out_string( blanks, crt_only );
      goto repeat2;
    end;

  assign( mats, 'matrix.dat' );
  reset( mats );

  assign( mata, your_name );
  rewrite( mata );

  for i := 0 to 4 do
    begin
      seek( mats, i );
      read( mats, mat );
      seek( mata, i );
      write(mata, mat );
    end;
  close( mats );
  close( mata );

end;
```

FILE: UPDATE.PAS

```
(*****************************************************************
******************************************************************
**                                                              **
**      file:              VALNDEC.PAS                          **
**      procedure contained:  val_n_dec                         **
**      function contained:   check_word                        **
**      version:           1.7                                  **
**      date:              29 October 1984                      **
**      description:       This file contains the procedures that **
**                         validate and decode the user input   **
**                         command line.                        **
**      author:            vincent m. parisi ii, capt., usaf    **
**                                                              **
******************************************************************
*****************************************************************)

(*****************************************************************
*                                                                *
*       function:          check_word                            *
*       version:           1.1                                   *
*       date:              29 October 1984                       *
*       description:       This function returns "true" if there is *
*                          a match between the dictionary word and *
*                          the command word.  The function takes into *
*                          account abbreviations of command words. *
*       passed variables:          decode, command               *
*       returned variables:        command, check_word           *
*       procedures called:         trim                          *
*       called by:         val_n_dec                             *
*       author:            Paul A. Moore, capt., usaf            *
*                                                                *
*****************************************************************)

function check_word(decode : dictionary; command : cmdword) : boolean;

var
    dword     : cmdword;
    d_len     : integer;
    cmd_len   : integer;
    i         : integer;

begin
    dword  := decode.dictword;     (* get rid of trailing blanks *)
    trim(dword);
    trim(command);

    check_word := false;           (* default to no match        *)
    if command = dword then
        check_word := true
    else
      begin
        d_len   := length(dword);
        cmd_len := length(command);

        (* make sure the command isn't too long or short         *)
        if (cmd_len >= decode.abbrev) and (cmd_len <= d_len) then
          begin     (* compare characters *)
            i := 1;
            while  (i <= cmd_len) and
                   ( UpCase(command[i]) = UpCase(dword[i]) ) do
                i := i + 1;
            if ( i = cmd_len+1 ) then check_word := true;
          end;
      end;
end;  (* end check_word  *)

(*******************************************************************
*                                                                  *
*       procedure:       val_n_dec                                 *
*       version:         1.6                                       *
*       date:            16 august 1983                            *
*       description:     This procedure validates and decodes the  *
*                        command line input by the user. The       *
*                        process begins by recovering record 1     *
*                        from the syntax table, using get_line.    *
*                        A comparison is made with the first       *
*                        word in the command buffer.  If there is  *
*                        no match, the next record pointed to by   *
*                        nomatchp is retrieved with get_line.      *
*                        The comparisons continue until a match    *
*                        is found and the routine goes to the      *
*                        next level.  If at any level no match     *
*                        is found after exhausting all the         *
*                        possibilities for that level then the     *
*                        error code is set to 'b' and the rou-     *
*                        tine is exited.  If a valid command       *
*                        is decoded but there are still some       *
*                        words present in the commandbuffer, the   *
*                        error code is set to 'c'.  The error      *
*                        code is set to 'n' for a valid command.   *
*       global variables used:    cmdbuffer, call_routine          *
*       global variables changed: cmdbuffer, call_routine          *
*       global constants used:    DONEWORD, ENDCODE                *
*       passed variables:         level, rec_num, error_code,      *
*                                 num_of_commands, cmdbuffer,      *
*                                 call_routine                     *
*       returned variables:       level, rec_num, error_code,      *
*                                 cmdbuffer, call_routine          *


FILE: VALNDEC.PAS
*       procedures called:        check_word, trim, get_line          *
*       called by:       get_com                                      *
*       author:          vincent m. parisi ii, capt., usaf            *
*                                                                     *
***********************************************************************)

procedure val_n_dec( var level : integer; var rec_num : integer;
                var error_code : char; num_of_commands : integer;
                var cmdbuffer : buffer; var call_routine : cmdword );

var    last_rec_num : integer;
       cmd          : cmdword;

begin
  (* "last_rec_num" points to the beginning of a list of options  *)
  last_rec_num := rec_num;          (* save rec num*)

  (* If the word does not match, get the next
     record which is pointed to by nomatchp.  repeat this until we
     run out of words indicated by an "ENDCODE" in nomatchp or there
     is a match.                                                         *)

  while (( error_code = 'a' ) and ( level <= ( num_of_commands + 1 ))) do
    begin

      (* get the syntax line for entry rec_num  *)
      get_line( decode, rec_num );

      cmd := decode.dictword;
      trim(cmd);
      if cmd = DONEWORD then
        begin
          if level = ( num_of_commands + 1 ) then
            begin
              error_code := 'n';
              call_routine := decode_dict.words[decode.matchp];
            end
          else
            begin
              error_code := 'c';
              rec_num := last_rec_num;
            end;
        end
      else
       if cmdbuffer[ level ] = '              ' then
         error_code := 'd'
       else
          if check_word(decode,cmdbuffer[level]) then
            begin


FILE: VALNDEC.PAS
```

```
           cmdbuffer[level] := decode.dictword; (* replace possible abbr.*)
           level := level + 1;
           rec_num := decode.matchp;
           last_rec_num := rec_num;           (* point to first record *)
         end                                  (* of options for the next *)
       else                                   (* level of commands       *)
         if decode.nomatchp = ENDCODE then
           begin                              (* invalid command word    *)
             error_code := 'b';
             rec_num := last_rec_num;
           end
         else                                 (* try next option         *)
           rec_num := decode.nomatchp;
   end;   (* end while  *)
end;
```

FILE: VALNDEC.PAS

Appendix F: BUILDDAT Text Files

This Appendix contains the five (5) text files that are used by BUILDDAT to install the menu system. These text files describe the hardware environment (TERM.TXT and PRINT.TXT), help text (HELP.TXT), and the menu structure (MENU.TXT and PARAM.TXT). These particular test files were developed for this thesis effort. If a text file has several different versions, the particular machine and configuration is annotated in the footer of the text file.

These files are in the order which they were presented above.

```
1  2     Cursor Positioning, initial char sequence          TERM.TXT
2  27    ESC                                             ZENITH Z-100
3  89    Y
4  0
5  0
6  0
7  32    row offset
8  32    column offset
9  0
10 0     intermediate character(s)
11 0
12 0
13 0
14 0     terminating character(s)
15 0
16 0
17 0
18 0
19 2     Clear Screen, Home Cursor
20 27    ESC
21 69    E
22 0
23 0
24 0
25 0
26 0
27 2     Highlight (enter reverse video)
28 27    ESC
29 112   p
30 0
31 0
32 0
33 0
34 2     Normal Video (exit reverse video)
35 27    ESC
36 113   q
37 0
38 0
39 0
40 2     Enter Graphics Mode
41 27    ESC
42 70    F
43 0
44 0
45 0
46 0
47 2     Exit Graphics Mode
48 27    ESC
49 71    G


FILE: TERM.TXT     *** Zenith Z100 ***
```

```
50 0
51 0
52 0
53 0
54 96   Graphics - vertical line
55 97   Graphics - horizontal line
56 98   Graphics - line intersection (up and down)
57 94   Graphics - centered dot
58 105  Graphics - solid square (space in reverse video)
59 119  Graphics - line intersection (diagonal)
60 115  Graphics - top "T"
61 99   Graphics - upper right corner
62 100  Graphics - lower right corner
63 101  Graphics - lower left corner
64 102  Graphics - upper left corner
65 0
66 0
67 0
68 0
69 0
70 2    Normal Video (exit reverse video)
71 27   ESC
72 113  q
73 0
74 0
75 0
76 2    Video Bold (enter reverse video)
77 27   ESC
78 112  p
79 0
80 0
81 0
82 0
83 0
84 0
85 0
86 0
87 0
88 0
89 0
90 0    Cursor Addressing,   0=decimal   1=ASCII
91 0
92 0    Row offset for beginning of plot. (not used)
93 0    Column offset for beginning of plot. (not used)
94 0    Vertical resolution of plotting area. (not used)
95 0    Horizontal resolution of plotting area. (not used)
```

FILE: TERM.TXT   *** Zenith Z100 ***

```
1  2     Cursor Positioning, initial char sequence          TERM.TXT
2  27    ESC                                           IBM Monochrome
3  91    [
4  0
5  0
6  0
7  1     row offset
8  1     column offset
9  0
10 1     intermediate character(s)
11 59    ;
12 0
13 0
14 1     terminating character(s)
15 72    H
16 0
17 0
18 0
19 4     Clear Screen, Home Cursor
20 27    ESC
21 91    [
22 50    2
23 74    J
24 0
25 0
26 0
27 4     Highlight (enter reverse video)
28 27    ESC
29 91    [
30 55    7
31 109   m
32 0
33 0
34 4     Normal Video (exit reverse video)
35 27    ESC
36 91    [
37 48    0
38 109   m
39 0
40 0     Enter Graphics Mode
41 0
42 0
43 0
44 0
45 0
46 0
47 0     Exit Graphics Mode
48 0
49 0


FILE: TERM.TXT     *** IBM Monochrome ***
```

```
50 0
51 0
52 0
53 0
54 179  Graphics - vertical line
55 196  Graphics - horizontal line
56 197  Graphics - line intersection (up and down)
57 250  Graphics - centered dot
58 219  Graphics - solid square (space in reverse video)
59 88   Graphics - line intersection (diagonal)
60 194  Graphics - top "T"
61 191  Graphics - upper right corner
62 217  Graphics - lower right corner
63 192  Graphics - lower left corner
64 218  Graphics - upper left corner
65 0
66 0
67 0
68 0
69 0
70 4    Normal Video (exit video bold)
71 27   ESC
72 91   [
73 48   0
74 109  m
75 0
76 4    Video Bold
77 27   ESC
78 91   [
79 49   1
80 109  m
81 0
82 0
83 0
84 0
85 0
86 0
87 0
88 0
89 0
90 1    Cursor Addressing,   1 = decimal   0 = ASCII
91 0
92 0    Row offset for beginning of plot. (not used)
93 0    Column offset for beginning of plot. (not used)
94 0    Vertical resolution of plotting area. (not used)
95 0    Horizontal resolution of plotting area. (not used)
```

FILE: TERM.TXT   *** IBM Monochrome ***

```
1 0
2 0
3 0
4 0
5 0
6 0
7 0
8 0
9 0
10 0
11 0
12 0
13 0
14 0
15 0
16 0
17 0
18 0
19 0
20 0
21 0
22 0
23 0
24 0
25 0
26 0
27 0
28 0
29 0
30 0
31 0
32 0
33 0
34 0
35 0
36 0
37 0
38 0
39 0
40 0
41 0
42 0
43 0
44 0
45 0
46 0
47 0
48 0
49 0


FILE: PRINT.TXT
```

```
50 0
```

```
FILE: PRINT.TXT
```

```
The power of the polynomial must be > 0 and < 10.
<$> #2
What is the degree of the numerator... (max of 10)?
<$> #3
                    ...the denominator (max of 10)?
<$> #4
            INVALID Keyword or Abbreviation
<$> #5
              This is a valid command, the rest is extraneous.
<$> #6
Numerator
<$> #7
Denominator
<$> #8
TRANSFER FUNCTION INPUT
<$> #9
|                  This is not a valid input, reenter                  |
<$> #10
                You cannot input a complex number for the last
                 root. There is no room for its conjugate.
<$> #11
              Do you want computer determined boundaries <C> or
              boundaries previously saved <S>...
                             Enter an <S> or <C>...
<$> #12
             Enter an <S> or <C>...or a <$> to abort....
<$> #13
  |                 To exit, enter <$>;  for more, press <CR>.           |
<$> #14
              Polynomial                                Roots
   Constant/Gain =                       Constant/Gain =
<$> #15
                    ICECAPPC SYSTEM HELP INFORMATION

      The ICECAPPC program provides an environment for control system
design and analysis hosted on a microcomputer. This system is menu
driven and will provide help upon request.

The following is a list of the ICECAPPC main menu options:

     CHANGE    - Allows the user to change analysis plane and sampling time.
     COPY      - Allows the user to copy one transfer function into another
                 or one matrix into another.
     DEFINE    - Allows the user to define a transfer function or a matrix.
               - Any submenu option with an (*) has not been implemented yet.
     DISPLAY   - Displays the results, transfer functions, or matrices on
                 the screen.
               - Any submenu option with an (*) has not been implemented yet.
     FORM      - Forms a CLTF from an OLTF or a combination of GTF and HTF.


FILE: HELP.TXT
```

```
     HELP      - Provides on-line help to the user.
     MODIFY    - Add a root or delete a root from a transfer function.
               - Change a single location of a matrix.
     PRINT     - Sends screen output to the printer.
               - Any submenu option with and (*) has not been implemented yet.
     RECOVER   - Used to continue continue a previous session. Will copy files
                 into ICECAPPC memory.
     STOP      - Normal command for leaving ICECAPPC.
     SWTICHES  - Flips the control switches ON and OFF.
     UPDATE    - Allows user to save current session to a user specified file.

COMMAND INPUT
        The command input structure is made up of a hierarchy of menus
containing keywords (or command words).  After a keyword is entered
it is validated against the valid keywords for the current menu. If
the keyword is valid the next lower menu of keywords is displayed or
a prompt from the selected function appears.  If an invalid keyword is
entered the keyword is highlighted on the "Enter Option >" line and the
user is prompted to enter a valid keyword.  If the user knows the valid
keywords at the next lower level menu for a keyword in the current menu
the user may "type ahead" keywords for lower levels in the menu structure.

Example:  HELP SYSTEM
          HELP FUNC              (FUNC is an abbreviation for FUNCTION)

        Abbreviations are generally the first two or three
letters of the keyword.  Abbreviations are shown in bold for each
command word.  The Abbreviation shown in bold is the minimum number
of characters neccessary to identify a command word, additional
characters of the command word may be entered.  All characters entered
for a command word will be validated against the valid command words.

        If a mistake is noted prior to pressing the carriage return <CR>,
just use the backspace or delete key to erase backwards to the error.
Correct the error and retype the remainder of the command.  If the
program is prompting you for a command completion, you can only erase
the characters internally back to the point that began that prompt.

        At any point an input is expected from the user, ( either
command input or subroutine process ) the user may abort the process
and return to the command mode.  If a separate program is being
executed enter the "Exit" or "Abort" command for that program.

        To abort a command enter '$' followed by a carriage return
and you will be returned to the top ICECAPPC menu.
<$> #16
                          CHANGE COMMAND

     The CHANGE command is used to initialize the CHANGE functions of
```

ICECAPPC. This function allows the user to select the plane of analysis and to change the sampling time, TSAMP. The proper format for the CHANGE command is:

```
                    CHANGE PLANE  or  CHANGE TSAMP
```

The system will provide a menu of allowable plane changes in response to the first command. This option has not been implemented yet.
<$> #17

COPY COMMAND

The command COPY is used to move the contents of one Transfer Function, called the Source, to a second Transfer Function called the Destination. The COPY command does not destroy the contents of the Source. COPY may also be used to move the contents of matrices and polynomials.

The proper format of the COPY command is as follows:

```
               COPY <source_name> <destination_name> <CR>
```

For example:

```
               COPY GTF OLTF <CR>
                       or
               COPY MATA MATB <CR>
```

ICECAPPC will supply a menu of allowable transfer functions/matrices for both the source and the destination. ICECAPPC will not allow you to copy a transfer function to a matrix or vice versa.
<$> #18

DEFINE COMMAND

The command DEFINE is used to initialize the Transfer Functions, Polynomials, and Matrices of ICECAPPC so that further calculations using those functions and/or matrices can be executed. The input to the system is set with this command.

If you try to manipulate a variable that has not been defined the system will prompt you for the necessary information. The proper format for the DEFINE command is as follows:

```
               DEFINE (transfer function) (fact/poly)
                                    or
               DEFINE (matrix)
```

The system will prompt you for the required data. If you provide incorrect data for the prompt ICECAPPC will describe the error and prompt you for input again. For example, let us assume you have entered the command:

```
        DEFINE GTF POLY
```

The system prompt will be:

```
        What is the degree of the numerator... ( max of 10 ) ?
```

You would enter the integer value of the numerator degree. ICECAPPC will then display the following prompt:

```
                              ... the denominator ( max of 10 ) ?
```

Again input an integer value. ICECAPPC will then draw a display screen for the transfer function. ICECAPPC will highlight the first input area and provide a prompt:

```
        Your number ...
```

Input the real number you would like in the input area. If you have selected the factored input format, and have entered the first half of a complex conjugate pair, ICECAPPC will enter the second half of the pair. If you try to enter the first half of a complex conjugate pair in the last root location, ICECAPPC will tell you this is an invalid input and prompt you to enter the root again.

The matrix definition option of ICECAPPC will also prompt you for the necessary information. You will be prompted for the number of rows and the number of columns. You are limited to a max of 10 rows and a max of 10 columns. ICECAPPC will draw the display screen for the matrix and highlight the input area and provide the prompt:

```
        Your number...
```

ICECAPPC will provide a menu of tranfer functions, polynomials, and matrices that may be specified with the DEFINE command.

<$> #19

DISPLAY COMMAND

The command DISPLAY is used to write information onto the terminal screen. This information generally takes the form of plots of system response, the listing of the system specification, or a root locus plot. DISPLAY may also be used to display the current contents of transfer function and matrices in the data base of ICECAPPC. The proper format of the DISPLAY command is as follows:

```
                              DISPLAY (object)
```

```
     ICECAPPC will provide a menu of allowable 'objects' in response to the
DISPLAY command. Any 'object' followed by an asterisk (*) has not been
implemented yet.
<$> #20
                          FORM COMMAND

     The FORM command is used to produce the CLTF from either the
OLTF or a combination of GTF and HTF. The formula for producing the
CLTF is as follows:

          CLTF = (GAIN * GTF ) / ( 1 + GAIN * GTF * HTF )
          CLTF = (GAIN * OLTF) / ( 1 + GAIN * OLTF )
          CLTF = GTF + HTF ( In Parallel )

This option will also form the OLTF from the GTF and the HTF. The
formula for that operation is:

                          OLTF = GTF * HTF
<$> #21
                          DISPLAY POLY COMMANDS

     The ADD, SUBTRACT, and MULTIPLY options will prompt you for
the names of the two polynomials you wish to ADD, SUBTRACT, or MULTIPLY
together. ICECAPPC will also prompt you for the name of the polynomial
that you wish the new polynomial stored into.

     If you input one of the thirteen polynomial names the polynomial
of your choice will be displayed on the screen.
<$> #22
                          PRINT COMMAND

     The command PRINT is used to write information to an external file
as well as to the terminal screen. The contents of the external file can
be sent to a printer at the conclusion of the design session. PRINT is
most often used to summarize the last iteration of a design session. If
you wish to view the data before it is sent to the print the DISPLAY command
may be used. Further instructions for DISPLAY may be found using the HELP
command. This is a good way to ensure a 'clean copy' to the printer. The
proper format for the PRINT command is as follows:

                          PRINT (object)

     ICECAPPC will provide a menu of allowable 'objects' in response to
the PRINT command. Any 'object' followed by an asterisk (*) has not
been implemented yet.
<$> #23
                          RECOVER COMMAND

     RECOVER is used to copy user specified files into ICECAPPC memory


FILE: HELP.TXT
```

so that you can continue a previous session at the point where you left off. The user files were previously specified with the UPDATE command. You may only RECOVER files that exist on the disk.

CAUTION: **Be sure you input the transfer function and polynomial file name in response to the 'tf&pols.dat' prompt, and the matrix** file name in response to the 'matrix.dat' prompt. If you mix the two ICECAPPC will think there is NO data in either of its internal files.

<$> #24

STOP COMMAND

The STOP command is used to exit gracefully from ICECAPPC. Information is always stored in the ICECAPPC 'tf&pols.dat' and the 'matrix.dat' files for later use. If you desire to save this information in a user specified file use the UPDATE command. STOP is the normal mode for leaving ICECAPPC.

<$> #25

MODIFY COMMAND

The modify command is used to change polynomials and matrices without redefining the entire polynomial or matrix. If you desire to change a transfer function this may be done by modifying the numerator polynomial, tne denominator polynomial or both.

ADDROOT:

The ADDROOT command is used to modify or insert a root into a polynomial. In response to the ADDROOT command ICECAPPC will provide a *menu of available polynomials. An example of* the command line is:

```
ADDROOT ODPOLY
```

After you have correctly entered the name of the polynomial ICECAPPC will display the polynomial and prompt you with:

```
Your number ...
```

In addition the real area of the additional root will be highlighted. In response to the prompt enter a real number. You will then be prompted for the imaginary part of the root. If any input other than zero is made ICECAPPC will calculate the conjugate of this root. After you have correctly input the root ICECAPPC will recompute the polynomial and it will be displayed on the screen.

DELROOT:

The DELROOT command is used to remove or delete a root from a a polynomial. In response to the DELROOT command ICECAPPC will provide a menu of available polynomials. An example of a command line is:

```
DELROOT ONPOLY
```

After you have correctly entered the name of a polynomial ICECAPPC will display the polynomial and prompt you with:

The number of the root you wish to delete is...

The numbers of the roots can be found to the left of the factored display. If the root you have chosen to delete is complex the conjugate will also be deleted. After ICECAPPC has recomputed the new polynomial it will be displayed on the screen.

CHANGE:

The CHANGE command is used to *modify a single location in a* matrix. In response to to CHANGE command ICECAPPC will provide a menu of matrices that may be modified. An example of the command line is:

CHANGE MATA

After you have correctly entered the name of the matrix ICECAPPC will display the matrix and prompt you with:

The row of the location you wish to modify ?

Enter a valid row number. The system will then prompt:

...the column ?

Enter a valid column number. ICECAPPC will then highlight the location and provide the prompt:

Your number...

ICECAPPC will then store the new matrix in the correct location and re-display it to you.
<$> #26

SWITCHES COMMAND

The *command* SWITCHES is used to *flip various control* switches ON and OFF. The proper format for the SWITCHES command is as follows:

SWITCH (object) (ON/OFF)

for example:

SWITCH PRINTER ON

ICECAPPC will provide a menu of allowable 'objects' for the SWITCHES command.

The switches of ICECAPPC and the functions they control:

FILE: HELP.TXT

```
      ANSWER     ON  Causes all output to go to an external file
                 OFF Output is displayed at user terminal
      CANCEL     ON  Cancels the common roots of transfer functions
                 OFF Matching poles and zeros are not cancelled
      CLOSED     ON  Closed Loop (CLTF) used if there is a choice
                 OFF Open Loop Transfer Function is used
      DECIBELS   ON  Magnitudes of plots are in decibels
                 OFF Actual magnitude is output
      GRID       ON  Draw grid lines on plots
                 OFF Omit grid lines from plots
      HERTZ      ON  Frequency data input/output in hertz
                 OFF Frequency data input/output in rad/sec
      MAINMENU   ON  Display initial menu of ICECAPPC command words
                 OFF Supress display of initial menu

This option has not been implemented yet.
<$> #27
                              UPDATE COMMAND

     The UPDATE command may be used to periodically write all of the
contents of ICECAPPC memory files, 'tf&pols.dat' and 'matrix.dat' to
user specified files. ICECAPPC will provide prompts for the user name for
each of the files. This command is particularly useful when there is
more than one user of ICECAPPC or a single user is working on more than
one design in parallel. In order to write the user specified files
into the ICECAPPC files use the RECOVER command.
<$> #28
POLY

    This command will allow you to enter the polynomial/transfer function
of your choice with a polynomial format. ICECAPPC will ask you first for
the 'Constant/Gain', followed by prompts for the coefficients of the
polynomial terms.


FACTORED

    This command will allow you to enter the polynomial/transfer function
of your choice with the factored format. ICECAPPC will ask you first for
the 'Constant/Gain', followed by prompts for the real and the imaginary
portions of the roots. Remember if you want the root in the left half
plane the real part must be negative.
<$> #29
The system is S L O W L Y converging on a root, please be patient.
<$> #30
What is the power of the polynomial... (max of 10)?
<$> #31
POLYNOMIAL INPUT
<$> #32


FILE  HELP.TXT
```

```
$   #[illegible]
 [illegible] FUNCTION DISPLAY
$   #14
  POLYNOMIAL DISPLAY
<$> #35
                 POLYNOMIAL MANIPULATION

This function will            the second polynomial to(from) the first
and store the result in the third polynomial location.

Available polynomials are:
          ONPOLY        CNPOLY        GNPOLY        HNPOLY
          ODPOLY        CDPOLY        GDPOLY        HDPOLY
          POLYA         POLYB         POLYC         POLYD
          POLYE
<$> #36
Enter the name of the file you would like ICECAPPC's 'tf&pols.dat'
copied into. 'tf&pols.dat' contains all of the transfer function
and polynomial data. The file name should be eight characters or
less, and should not contain any blank spaces. The file need not
exist on your disk. ICECAPPC will create the file.

       Your file name:
<$> #37
Enter the name of the file you would like ICECAPPC'S 'matrix.dat'
copied into. 'matrix.dat' contains all of the matrix data. The file
name should be eight characters in length or less, and should not
contain any blank spaces. The file need not exist on your disk.
ICECAPPC will create the file.

       Your file name:
<$> #38
Enter the name of the file you would like to copy into ICECAPPC's
'tf&pols.dat'. 'tf&pols.dat' contains all of the transfer function
and polynomial data. The file name should be eight characters or
less, and should not contain any blank spaces. The file must
exist on your disk.

       Your file name:
<$> #39
Enter the name of the file you would like to copy into ICECAPPC'S
'matrix.dat' file. 'matrix.dat' contains all of the matrix data.
The file name should be eight characters in length or less, and
should not contain any blank spaces. The file must exist on your
disk.

       Your file name:
<$> #40


FILE: HELP.TXT
```

```
The number of rows or columns must be > 0 and <= 10
<$> #41
How many rows in your matrix ( max of 10 ) ?
<$> #42
                 ...columns ( max of 10 ) ?
<$> #43
MATRIX INPUT
<$> #44
The user specified filename must be 8 characters or less.
<$> #45
The row of the location you wish to modify ?
<$> #46
                     "  '   ...the column ?
<$> #47
The constant/gain cannot be equal to zero.
<$> #48
                        MATRIX MANIPULATION

This function will          the second matrix to(from) the first
and store the result in the third matrix location.

Available matrices are:

           MATA      MATB      MATC      MATD      MATE
<$> # 49
                       DISPLAY MATRIX COMMANDS

       The ADD, SUBTRACT, and MATXMULT will add, subtract, or
multiply two matrices together and store the result in a user selected
location. You will be prompted for the three matrix names.

       The INVERSE command will invert a matrix and store the matrix
in the user selected location. If you desire both the inverted matrix
and the storage matrix may be the same.

       The TRANSPOSE command will tranpose a matrix and store the
matrix in a user selcted location. If you desire both the transposed
matrix and the storage matrix may be the same.

       The SCLRMULT command will multiply a matrix by a scalar and
store the result in a user specified location. If you desire both
the original and the resulting matrices may be the same.

       The matrix name commands will display the named matrix to the
user.
<$> # 50
MATRIX DISPLAY
<$> # 51
The rows and the columns of the two matrices you wish to add or


FILE: HELP.TXT
```

```
subtract must be the same. This option has been aborted.
<$> # 52
The number of rows of the first matrix must equal the number of
columns of the second matrix. This option has been aborted.
<$> # 53
The matrix must be square for inversion i.e. the matrix must have
the same number of rows as columns. This option has been aborted.
<$> # 54
                       SINGLE MATRIX MANIPULATION

The available matrices are:

           MATA      MATB      MATC      MATD      MATE

The matrix to be manipulated ...

The desired storage location ...
<$> # 55
                       SCALAR * MATRIX = MATRIX

This option multiplies a scalar and a matrix together and stores the
resulting matrix in the desired location. The available matrices
are:
           MATA      MATB      MATC      MATD      MATE

The matrix to be multiplied ( MATRIX ) ...

                   the scalar (  REAL  ) ...

           storage location ( MATRIX ) ...
<$> # 56
The matrix you wish to invert is singular. This option has been aborted.
<$> # 57
The row of the location you wish to modify ?
                                   the column ?
<$> # 58
If the location you wish to modify is not on this page type 'NEXT',
The row of the location you wish to modify ?
                                   the column ?
<$> # 59
                              Form Command

1.   Form OLTF --->  OLTF = GTF * HTF
2.   Form CLTF --->  CLTF = (GAIN * GTF ) / ( 1 + GAIN * GTF * HTF )
3.   Form CLTF --->  CLTF = (GAIN * OLTF) / ( 1 + GAIN * OLTF )
4.   Form CLTF --->  CLTF = GTF + HTF ( In Parallel )

Your Selection ( Integer ) ...
<$> # 60


FILE: HELP.TXT
```

```
                SCALAR * POLYNOMIAL = POLYNOMIAL

This option multiplies a scalar and a polynomial together and stores the
resulting polynomial in the desired location. The available polynomials
are:
         ONPOLY        CNPOLY        GNPOLY        HNPOLY
         ODPOLY        CDPOLY        GDPOLY        HDPOLY
         POLYA         POLYB         POLYC         POLYD
         POLYE

The polynomial to be multiplied ( POLYNOMIAL ) ...

                          the scalar (  REAL  ) ...

                storage location ( POLYNOMIAL ) ...

<$> # 61
                              HELP Command

This help message is included for consistancy. In all lower level menus
the last entry on the bottom line is a HELP option. If you desire HELP
with the ICECAPPC system the command line would be:

            Enter Option > HELP SYSTEM

If you wish HELP with one of the main menu options the command line is:

            Enter Option > HELP (option)
<$> # 62
The leading coefficient of the polynomial cannot be zero. If you wish to
reduce the order of the polynomial abort this function and begin again.
<$> # 63
message 63
<$> # 64
message 64
<$> # 65
message 65
<$> # 66
message 66
<$> # 67
message 67
<$> # 68
message 68
<$> # 69
message 69
<$> # 70
message 70
<$$>


FILE: HELP.TXT
```

```
; ************************************************
; File Name: strawman menu structure for ICECAP-PC
; Creation date: 24 Jul 85
; Mod dat: 9 Aug 85 - add help structure
;          4 Sep 85 - add disp structure
;          7 Sep 85 - add insert structure
;          8 Sep 85 - add delete structure
;          18-21 Sep 85 - modified entire structure
;          7 Oct 85 - add time and freq structure
;          8 Oct 85 - add spolymlt
; ************************************************
CHANGE
DISPLAY
MODIFY
RECOVER
SWITCHES
COPY
FORM
PRINT
STOP
UPDATE
DEFINE
HELP
!
; *********************************************************
; define the menu options under CHANGE
; *********************************************************
$CHANGE
PLANE
TSAMP
HELP
!
; *****
; define the call routines for CHANGE.PLANE and CHANGE.TSAMP
; *****
.CHANGE.PLANE = CHANGE
.CHANGE.TSAMP = CHANGE
.CHANGE.HELP  = CHANGE
; *********************************************************
; define the menu options under COPY
; *********************************************************
$COPY
OLTF
CLTF
GTF
HTF
TF1
TF2
TF3


FILE: MENU.TXT
```

```
TF4
TF5
POLYA
POLYB
POLYC
POLYD
POLYE
ONPOLY
ODPOLY
CNPOLY
CDPOLY
GNPOLY
GDPOLY
HNPOLY
HDPOLY
MATA
MATB
MATC
MATD
MATE
HELP
!
; *****
; define menu for .COPY.OLTF option, this will be used by
; the other options under COPY
; *****
$COPY.OLTF
OLTF
CLTF
GTF
HTF
TF1
TF2
TF3
TF4
TF5
!
$COPY.POLYA
POLYA
POLYB
POLYC
POLYD
POLYE
ONPOLY
ODPOLY
CNPOLY
CDPOLY
GNPOLY
GDPOLY
```

FILE: MENU.TXT

```
HNPOLY
HDPOLY
;
; *****
; define the call routine for the COPY option
; *****
.COPY.HELP         = COPY
.COPY.OLTF.OLTF    = COPY
.COPY.OLTF.CLTF    = COPY
.COPY.OLTF.GTF     = COPY
.COPY.OLTF.HTF     = COPY
.COPY.OLTF.TF1     = COPY
.COPY.OLTF.TF2     = COPY
.COPY.OLTF.TF3     = COPY
.COPY.OLTF.TF4     = COPY
.COPY.OLTF TF5     = COPY
.COPY.POLYA.POLYA  = COPY
.COPY.POLYA.POLYB  = COPY
.COPY.POLYA.POLYC  = COPY
.COPY.POLYA.POLYD  = COPY
.COPY.POLYA.POLYE  = COPY
.COPY.POLYA.ONPOLY = COPY
.COPY.POLYA.ODPOLY = COPY
.COPY.POLYA.CNPOLY = COPY
.COPY.POLYA.CDPOLY = COPY
.COPY.POLYA.GNPOLY = COPY
.COPY.POLYA.GDPOLY = COPY
.COPY.POLYA.HNPOLY = COPY
.COPY.POLYA.HDPOLY = COPY
; *****
; define submenus for the other options under COPY
; *****
$COPY.CLTF       = COPY.OLTF
$COPY.GTF        = COPY.OLTF
$COPY.HTF        = COPY.OLTF
$COPY.TF1        = COPY.OLTF
$COPY.TF2        = COPY.OLTF
$COPY.TF3        = COPY.OLTF
$COPY.TF4        = COPY.OLTF
$COPY.TF5        = COPY.OLTF
$COPY.POLYA      = COPY.POLYA
$COPY.POLYB      = COPY.POLYA
$COPY.POLYC      = COPY.POLYA
$COPY.POLYD      = COPY.POLYA
$COPY.POLYE      = COPY.POLYA
$COPY.ONPOLY     = COPY.POLYA
$COPY.ODPOLY     = COPY.POLYA
$COPY.CNPOLY     = COPY.POLYA
$COPY.CDPOLY     = COPY.POLYA
```

FILE: MENU.TXT

```
$COPY.GNPOLY    = COPY.POLYA
$COPY.GDPOLY    = COPY.POLYA
$COPY.HNPOLY    = COPY.POLYA
$COPY.HDPOLY    = COPY.POLYA
$COPY.MATA
MATA
MATB
MATC
MATD
MATE
!
; *****
; define the call routine for the matrix options
; *****
.COPY.MATA.MATA = COPY
.COPY.MATA.MATB = COPY
.COPY.MATA.MATC = COPY
.COPY.MATA.MATD = COPY
.COPY.MATA.MATE = COPY
; *****
; define the submenus for the matrix options
; *****
$COPY.MATB = COPY.MATA
$COPY.MATC = COPY.MATA
$COPY.MATD = COPY.MATA
$COPY.MATE = COPY.MATA
; *******************************************************
; define the menu options under DEFINE
; *******************************************************
$DEFINE
OLTF
CLTF
GTF
HTF
TF1
TF2
TF3
TF4
TF5
POLYA
POLYB
POLYC
POLYD
POLYE
ONPOLY
ODPOLY
CNPOLY
CDPOLY
GNPOLY


FILE: MENU.TXT
```

```
GDPOLY
HNPOLY
HDPOLY
MATA
MATB
MATC
MATD
MATE
HELP
!
; *****
; define the menu options for DEFINE OLTF, these options are used by
; the other polynomial definition options
; *****
$DEFINE.OLTF
POLY
FACTORED
HELP
!
; define the call routines for POLY and FACTORED
.DEFINE.HELP    = DEFINE
.DEFINE.OLTF.HELP = DEFINE
.DEFINE.OLTF.POLY = DEFINE
.DEFINE.OLTF.FACTORED = DEFINE
$DEFINE.CLTF       = DEFINE.OLTF
$DEFINE.GTF        = DEFINE.OLTF
$DEFINE.HTF        = DEFINE.OLTF
$DEFINE.TF1        = DEFINE.OLTF
$DEFINE.TF2        = DEFINE.OLTF
$DEFINE.TF3        = DEFINE.OLTF
$DEFINE.TF4        = DEFINE.OLTF
$DEFINE.TF5        = DEFINE.OLTF
$DEFINE.POLYA      = DEFINE.OLTF
$DEFINE.POLYB      = DEFINE.OLTF
$DEFINE.POLYC      = DEFINE.OLTF
$DEFINE.POLYD      = DEFINE.OLTF
$DEFINE.POLYE      = DEFINE.OLTF
$DEFINE.ONPOLY     = DEFINE.OLTF
$DEFINE.ODPOLY     = DEFINE.OLTF
$DEFINE.CNPOLY     = DEFINE.OLTF
$DEFINE.CDPOLY     = DEFINE.OLTF
$DEFINE.GNPOLY     = DEFINE.OLTF
$DEFINE.GDPOLY     = DEFINE.OLTF
$DEFINE.HNPOLY     = DEFINE.OLTF
$DEFINE.HDPOLY     = DEFINE.OLTF
; *****
; define the call routines for the matrix options under DEFINE
; *****
.DEFINE.MATA      = DEFINE


FILE: MENU.TXT
```

```
.DEFINE.MATB      = DEFINE
.DEFINE.MATC      = DEFINE
.DEFINE.MATD      = DEFINE
.DEFINE.MATE      = DEFINE
; **********************************************************
; define the menu options under DISPLAY
; **********************************************************
$DISPLAY
OLTF
CLTF
GTF
HTF
GAIN*
BUTRWRTH*
BESSEL*
EQUATION*
FREQ/RESP
LOCUS*
LOC/GAIN*
LOC/BRAN*
MATRIX
MODERN*
NICHOLS*
NYQUIST*
INYQUIST*
PAR/FRAC*
POLY
RICATTI*
ROUTH*
SPECS
SWITCHES*
TIME/RESP
HELP
!
; *****
; define the options for the DISPLAY.FREQ/RESP option
; *****
$DISPLAY.FREQ/RESP
OLTF
CLTF
GTF
HTF
TF1
TF2
TF3
TF4
TF5
HELP
!


FILE: MENU.TXT
```

```
; *****
; define the call routines for DISPLAY.FREQ/RESP
; *****
.DISPLAY.FREQ/RESP.OLTF = FREQ/RESP
.DISPLAY.FREQ/RESP.CLTF = FREQ/RESP
.DISPLAY.FREQ/RESP.GTF = FREQ/RESP
.DISPLAY.FREQ/RESP.HTF = FREQ/RESP
.DISPLAY.FREQ/RESP.TF1 = FREQ/RESP
.DISPLAY.FREQ/RESP.TF2 = FREQ/RESP
.DISPLAY.FREQ/RESP.TF3 = FREQ/RESP
.DISPLAY.FREQ/RESP.TF4 = FREQ/RESP
.DISPLAY.FREQ/RESP.TF5 = FREQ/RESP
.DISPLAY.FREQ/RESP.HELP = FREQ/RESP
; *****
; define the options for the DISPLAY.POLY option
; *****
$DISPLAY.POLY
ADD
SUBTRACT
POLYMLT
SPOLYMLT
POLYA
POLYB
POLYC
POLYD
POLYE
ONPOLY
ODPOLY
CNPOLY
CDPOLY
GNPOLY
GDPOLY
HNPOLY
HDPOLY
HELP
!
; *****
; define the call routines for DISPLAY.POLY
; *****
.DISPLAY.POLY.POLYA = DISPLAY
.DISPLAY.POLY.POLYB = DISPLAY
.DISPLAY.POLY.POLYC = DISPLAY
.DISPLAY.POLY.POLYD = DISPLAY
.DISPLAY.POLY.POLYE = DISPLAY
.DISPLAY.POLY.ONPOLY = DISPLAY
.DISPLAY.POLY.ODPOLY = DISPLAY
.DISPLAY.POLY.CNPOLY = DISPLAY
.DISPLAY.POLY.CDPOLY = DISPLAY
.DISPLAY.POLY.GNPOLY = DISPLAY
```

FILE: MENU.TXT

```
.DISPLAY.POLY.GDPOLY = DISPLAY
.DISPLAY.POLY.HNPOLY = DISPLAY
.DISPLAY.POLY.HDPOLY = DISPLAY
.DISPLAY.POLY.ADD = DISPLAY
.DISPLAY.POLY.SUBTRACT = DISPLAY
.DISPLAY.POLY.POLYMLT = DISPLAY
.DISPLAY.POLY.SPOLYMLT = DISPLAY
.DISPLAY.POLY.HELP     = DISPLAY
; *****
; define the options for DISPLAY.MATRIX
; *****
$DISPLAY.MATRIX
ADD
SUBTRACT
MATXMULT
SCLRMULT
INVERSE
TRANSPOSE
MATA
MATB
MATC
MATD
MATE
HELP
!
; ******
; define the call options for DISPLAY.MATRIX
; ******
.DISPLAY.MATRIX.ADD      = DISPLAY
.DISPLAY.MATRIX.SUBTRACT = DISPLAY
.DISPLAY.MATRIX.MATXMULT = DISPLAY
.DISPLAY.MATRIX.SCLRMULT = DISPLAY
.DISPLAY.MATRIX.INVERSE  = DISPLAY
.DISPLAY.MATRIX.TRANSPOSE = DISPLAY
.DISPLAY.MATRIX.MATA = DISPLAY
.DISPLAY.MATRIX.MATB = DISPLAY
.DISPLAY.MATRIX.MATC = DISPLAY
.DISPLAY.MATRIX.MATD = DISPLAY
.DISPLAY.MATRIX.MATE = DISPLAY
.DISPLAY.MATRIX.HELP = DISPLAY
; *****
; define the options for the DISPLAY.TIME/RESP option
; *****
$DISPLAY.TIME/RESP
OLTF
CLTF
GTF
HTF
TF1
```

FILE: MENU.TXT

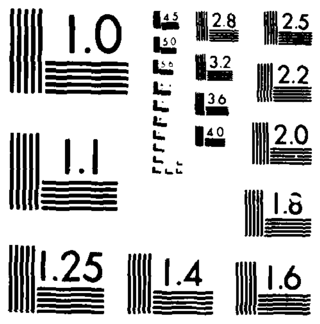
```
TF2
TF3
TF4
TF5
HELP
!
; *****
; define the call routines for DISPLAY.TIME/RESP
; *****
.DISPLAY.TIME/RESP.OLTF = TIME/RESP
.DISPLAY.TIME/RESP.CLTF = TIME/RESP
.DISPLAY.TIME/RESP.GTF = TIME/RESP
.DISPLAY.TIME/RESP.HTF = TIME/RESP
.DISPLAY.TIME/RESP.TF1 = TIME/RESP
.DISPLAY.TIME/RESP.TF2 = TIME/RESP
.DISPLAY.TIME/RESP.TF3 = TIME/RESP
.DISPLAY.TIME/RESP.TF4 = TIME/RESP
.DISPLAY.TIME/RESP.TF5 = TIME/RESP
.DISPLAY.TIME/RESP.HELP = TIME/RESP

; *****
; define the other call routines for DISPLAY
; *****
.DISPLAY.GTF     = DISPLAY
.DISPLAY.HTF     = DISPLAY
.DISPLAY.OLTF    = DISPLAY
.DISPLAY.CLTF    = DISPLAY
.DISPLAY.GAIN*     = DISPLAY
.DISPLAY.BUTRWRTH* = DISPLAY
.DISPLAY.BESSEL*       = DISPLAY
.DISPLAY.EQUATION*     = DISPLAY
.DISPLAY.HELP       = DISPLAY
.DISPLAY.LOCUS*        = DISPLAY
.DISPLAY.LOC/GAIN*  = DISPLAY
.DISPLAY.LOC/BRAN*  = DISPLAY
.DISPLAY.MODERN*         = DISPLAY
.DISPLAY.NICHOLS*        = DISPLAY
.DISPLAY.NYQUIST*        = DISPLAY
.DISPLAY.INVQUIST*       = DISPLAY
.DISPLAY.PAR/FRAC* = DISPLAY
.DISPLAY.RICATTI*        = DISPLAY
.DISPLAY.ROUTH*          = DISPLAY
.DISPLAY.SPECS          = DISPLAY
.DISPLAY.SWITCHES*       = DISPLAY
; ********************************************************
; define the menu options under FORM
; ********************************************************
.FORM      = FORM
; ********************************************************
```

FILE: MENU.TXT

```
; define the menu options under HELP
; ************************************************************
$HELP
SYSTEM
FUNCTION
!
;  *****
; define the menu option under HELP.FUNCTION
;  *****
$HELP.FUNCTION
CHANGE
DISPLAY
MODIFY
RECOVER
SWITCHES
COPY
FORM
PRINT
STOP
UPDATE
DEFINE
HELP
!
;  *****
; define the call routines for HELP options
;  *****
.HELP.SYSTEM    = HELP
.HELP.FUNCTION.CHANGE   = HELP
.HELP.FUNCTION.COPY     = HELP
.HELP.FUNCTION.DEFINE   = HELP
.HELP.FUNCTION.DISPLAY  = HELP
.HELP.FUNCTION.FORM     = HELP
.HELP.FUNCTION.MODIFY   = HELP
.HELP.FUNCTION.PRINT    = HELP
.HELP.FUNCTION.RECOVER  = HELP
.HELP.FUNCTION.STOP    ′= HELP
.HELP.FUNCTION.SWITCHES = HELP
.HELP.FUNCTION.UPDATE   = HELP
.HELP.FUNCTION.HELP = HELP
; *********************************************************
; define the menu options under MODIFY
; *********************************************************
$MODIFY
ADDROOT
DELROOT
CHANGE
HELP
!
; *****


FILE: MENU.TXT
```

AD-A164 044 DEVELOPMENT OF A COMPUTER AIDED DESIGN PACKAGE FOR CONTROL SYSTEM DESIGN A..(U) AIR FORCE INST OF TECH WRIGHT-PATTERSON AFB OH SCHOOL OF ENGI.. 5/5

UNCLASSIFIED S K MASHIKO ET AL. DEC 85 F/G 9/2 NL


1.0
4.5
5.0
5.6
2.8
2.5
3.2
2.2
3.6
4.0
2.0
1.1
1.8
1.25
1.4
1.6

```
; define the options under MODIFY.ADDROOT
; *****
$MODIFY.ADDROOT
POLYA
POLYB
POLYC
POLYD
POLYE
ONPOLY
ODPOLY
CNPOLY
CDPOLY
GNPOLY
GDPOLY
HNPOLY
HDPOLY
!
; *****
; define the call routines for MODIFY.ADDROOT
; *****
.MODIFY.ADDROOT.POLYA  = MODIFY
.MODIFY.ADDROOT.POLYB  = MODIFY
.MODIFY.ADDROOT.POLYC  = MODIFY
.MODIFY.ADDROOT.POLYD  = MODIFY
.MODIFY.ADDROOT.POLYE  = MODIFY
.MODIFY.ADDROOT.ONPOLY = MODIFY
.MODIFY.ADDROOT.ODPOLY = MODIFY
.MODIFY.ADDROOT.CNPOLY = MODIFY
.MODIFY.ADDROOT.CDPOLY = MODIFY
.MODIFY.ADDROOT.GNPOLY = MODIFY
.MODIFY.ADDROOT.GDPOLY = MODIFY
.MODIFY.ADDROOT.HNPOLY = MODIFY
.MODIFY.ADDROOT.HDPOLY = MODIFY
; *****
; define the options under MODIFY.DELROOT
; *****
$MODIFY.DELROOT
POLYA
POLYB
POLYC
POLYD
POLYE
ONPOLY
ODPOLY
CNPOLY
CDPOLY
GNPOLY
GDPOLY
HNPOLY
```

FILE: MENU.TXT

```
HDPOLY
!
; *****
; define the call routines for MODIFY.DELROOT
; *****
.MODIFY.DELROOT.POLYA  = MODIFY
.MODIFY.DELROOT.POLYB  = MODIFY
.MODIFY.DELROOT.POLYC  = MODIFY
.MODIFY.DELROOT.POLYD  = MODIFY
.MODIFY.DELROOT.POLYE  = MODIFY
.MODIFY.DELROOT.ONPOLY = MODIFY
.MODIFY.DELROOT.ODPOLY = MODIFY
.MODIFY.DELROOT.CNPOLY = MODIFY
.MODIFY.DELROOT.CDPOLY = MODIFY
.MODIFY.DELROOT.GNPOLY = MODIFY
.MODIFY.DELROOT.GDPOLY = MODIFY
.MODIFY.DELROOT.HNPOLY = MODIFY
.MODIFY.DELROOT.HDPOLY = MODIFY
; *****
; define the options under MODIFY.CHANGE
; *****
$MODIFY.CHANGE
MATA
MATB
MATC
MATD
MATE
!
; *****
; define the call routines for MODIFY.CHANGE
; *****
.MODIFY.CHANGE.MATA = MODIFY
.MODIFY.CHANGE.MATB = MODIFY
.MODIFY.CHANGE.MATC = MODIFY
.MODIFY.CHANGE.MATD = MODIFY
.MODIFY.CHANGE.MATE = MODIFY
; *****
; define the call for MODIFY.HELP
; *****
.MODIFY.HELP = MODIFY
; ******************************************************
; define the menu options under PRINT
; ******************************************************
$PRINT
OLTF*
CLTF*
GTF*
HTF*
GAIN*


FILE: MENU.TXT
```

```
BUTRWRTH*
BESSEL*
EQUATION*
FRQ/RESP*
LOCUS*
LOC/GAIN*
LOC/BRAN*
MATRIX*
MODERN*
NICHOLS*
NVQUIST*
INVQUIST*
PAR/FRAC*
POLY*
RICATTI*
ROUTH*
SPECS*
SWITCHES*
TIM/RESP*
HELP
!
; *****
; define the call routines for the PRINT options
; *****
.PRINT.GTF*    = PRINT
.PRINT.HTF*    = PRINT
.PRINT.OLTF*   = PRINT
.PRINT.CLTF*   = PRINT
.PRINT.GAIN*   = PRINT
.PRINT.BUTRWRTH* = PRINT
.PRINT.BESSEL*      = PRINT
.PRINT.EQUATION*    = PRINT
.PRINT.FRQ/RESP*    = PRINT
.PRINT.LOCUS*       = PRINT
.PRINT.LOC/GAIN*  = PRINT
.PRINT.LOC/BRAN*  = PRINT
.PRINT.MATRIX*         = PRINT
.PRINT.MODERN*         = PRINT
.PRINT.NICHOLS*        = PRINT
.PRINT.NVQUIST*        = PRINT
.PRINT.INVQUIST*       = PRINT
.PRINT.PAR/FRAC* = PRINT
.PRINT.POLY*           = PRINT
.PRINT.RICATTI*        = PRINT
.PRINT.ROUTH*          = PRINT
.PRINT.SPECS*          = PRINT
.PRINT.SWITCHES*       = PRINT
.PRINT.TIM/RESP*       = PRINT
.PRINT.HELP            = PRINT
```

FILE: MENU.TXT

```
; ******************************************************
; the call routines for the other options
; ******************************************************
.RECOVER = RECOVER
.STOP     = STOP
.SWITCHES = SWITCHES
.UPDATE   = UPDATE
;
```

FILE: MENU.TXT

```
1 1 Printer = false, Printer disabled
2 1 Trans   = false, Transaction file disabled
3 1 Temp    = false, Temporary file output disabled
4 0 Crt     = true,  Crt output enabled
5 1 show_abbreviation = false, not used
6 0 in_terminal = true, input from terminal enabled
7 0 stat_on     = true, display status line enabled
8 1 macro_error = false
9 1              not used
10 1             not used
1 3 help_level
2 1              not used
3 0                 "
4 0                 "
5 0                 "
6 0                 "
7 0                 "
8 0                 "
9 0                 "
10 0                "
1 1.0
2 -3.0
3 5.0
4 -1.0
5 0.0001
6 0.1
7 0.0
8 0.0
9 0.0
10 0.0
1 LST:            ; List device name
2 TRANSACT.ION    ; Transaction File name
3 MACRO.INP       ; Macro Input File name
4 STRING 4        ; description
5 STRING 5        ; description
6 STRING 6        ; description
7 STRING 7        ; description
8 STRING 8        ; description
9 STRING 9        ; description
10 STRING 10      ; description
```

FILE: PARAM.TXT

REFERENCES

1. Armold, Abraham T. Further Development Of An Interactive Control Engineering Computer Analysis Package (ICECAP) For Discrete and Continuous Systems. MS Thesis. School of Engineering, Air Force Institute of Technology (AU), Wright-Patterson Air Force Base, OH, December 1984.

2. Bullard, John. Interactive Computer Graphics for Analysis and Design of Control Systems. MS Thesis. School of Engineering, Air Force Institute of Technology (AU), Wright-Patterson Air Force Base, OH, December 1984.

3. Cooper, Doug and Clancy, Michael. OH! PASCAL!. New York: W.W. Norton and Company., 1982.

4. CP/M-86 Version 1.1 for the IBM Personal Computer Operating System, Digital Research, Inc., Monterery, Ca., 1983.

5. D'Azzo, John J. and Constantine H. Houpis. Linear Control System Analysis and Design: Conventional and Modern (Second Edition). New York: McGraw-Hill Book Company, 1981.

6. Disk Operating System Microsoft Corporation, Boca Raton, Florida.

7. Fairly, Richard E. Software Engineering Concepts. New York: McGraw-Hill Book Company, 1985.

8. Fontana, Robert C., Professor Emeritis. Personal interview. AFIT, Wright-Patterson AFB OH, 24 Jul through present.

9. Freeman, Peter. "Fundamentals of Design," Tutorial on Software Design Techniques, Fourth Edition, edited by Peter Freeman and Anthony I. Wasserman. Silver Spring, MD: IEEE Computer Society Press, 1983.

10. Gembrowski, Charles J. Devlopment of an Interactive Control Engineering Package (ICECAP) for Discrete and Continuous Systems. MS Thesis. School of Engineering, Air Force Institute of Technology (AU), Wright-Patterson Air Force Base OH, December 1982.

11. IMSL Library User's Manual, IMSL, Houston, TX, 1984.

12. James, M.L., Smith, G.M., Wolford, J.C. Applied Numerical Methods For Digital Computation, New York: Harper & Row, 1977.

13. Larimer, Stanley J. An Interactive Computer-Aided Design Program for Digital and Continuous Control System Analysis and Synthesis. MS Thesis. School of Engineering, Air Force Institute of Technology (AU), Wright-Patterson Air Force Base OH, December 1978.

14. Leong-Hong, Belkis W. and Bernard K. Plagman. Data Dictionary/Directory Systems. New York: John Wiley & Sons, 1982.

15. Logan, Glen T. Development of an Interactive Computer Aided Design Program for Digital and Continuous Control System Analysis and Synthesis. MS Thesis. School of Engineering, Air Force Institute of Technology (AU), Wright-Patterson Air Force Base OH, December 1983.

16. Lorentz, Mark C., Graduate Student. Personal interview. AFIT, Wright-Patterson AFB OH, September 1985.

17. Moore, Paul A. Extension of the Software Development Workbench to Include Microcomputer Workstations. MS Thesis. School of Engineering, Air Force Institute of Technology (AU), Wright-Patterson Air Force Base OH, December 1984.

18. Narathong, Chiewcharn. A Modern Control Theory Enhancement to an Interactive Control Engineering Computer Analysis Package (ICECAP). MS Thesis. School of Engineering, Air Force Institute of Technology (AU), Wright-Patterson Air Force Base OH, December 1984.

19. O'Brian, Frederick L. A Consolidated Computer Program for Control System Design. MS Thesis. School of Engineering, Air Force Institute of Technology (AU), Wright-Patterson Air Force Base OH, December 1976.

20. Parisi, Vincent M. Development of a Computer Aided Design Package For Control System Design and Analysis for Use On a Personal Computer. MS Thesis. School of Engineering, Air Force Institute of Technology (AU), Wright-Patterson Air Force Base OH, December 1983.

21. Shah, S.C. et al. MATRIXx User's Guide. Integrated Systems Inc., Palo Alto CA, 1982.

22. System Control Technology Inc. CTRL-C. Hawthorne CA, 1984.

23. Thompson, Peter M. User's Guide To Program CC, Version 3.0. Systems Technology, Inc., Hawthorne, California.

24. Travis, Mark A. Interactive Computer Graphics for System Analysis. MS Thesis. School of Engineering, Air Force Institute of Technology (AU), Wright-Patterson Air Force Base OH, December 1983.

25. TURBO-Pascal Reference Manual Version 2.0 Borland International, Scotts Valley, California.

26. Wilson, Robert E. Continued Development of an Interactive Control Engineering Computer Analysis Package (ICECAP) for Discrete and Continuous Systems. MS Thesis. School of Engineering, Air Force Institute of Technology (AU), Wright-Patterson Air Force Base OH, December 1983.

27. Woffinden, D.S., Professor. Personal interview. AFIT, Wright-Patterson AFB OH, 7 Nov 85.

VITA

Gary Tarczynski was born on 17 September 1957 in Chicago, Illinois. He graduated from the United States Air Force Academy in 1979 with a degree of Bachelor of Science in Electrical Engineering. Before arriving at the Air Force Institute of Technology (AFIT), he was stationed at Ellsworth AFB, SD, as a missile combat crew member and instructor.

Permanant Address: 7127 W. Lill St.
Niles, Il 60648

Susan Mashiko was born on 22 July 1958 in Glendale, California. She graduated from the United States Air Force Academy in 1980 with a degree of Bachelor of Science in Aeronautical Engineering. Before arriving at the AFIT, she was stationed at Los Angeles AFS, CA, as a project engineer and branch chief.

Permanant Address: 6429 McAbee Rd
San Jose, CA 95120

[illegible]

AFA [illegible]

SECURITY [illegible]

REPORT DOCUMENTATION PAGE

1a. [illegible]	1b. RESTRICTIVE MARKINGS
2a. [illegible]	3. DISTRIBUTION/AVAILABILITY OF REPORT Approved for public release; distribution unlimited
2b. [illegible]	
4. [illegible]	5. MONITORING ORGANIZATION REPORT NUMBER(S)
6a. NAME OF PERFORMING ORGANIZATION School of Engineering — 6b. OFFICE SYMBOL (If applicable) AFIT/ENG	7a. NAME OF MONITORING ORGANIZATION
6c. ADDRESS (City, State and ZIP Code) Air Force Institute of Technology Wright-Patterson, AFB, Ohio 45433	7b. ADDRESS (City, State and ZIP Code)
8a. NAME OF FUNDING/SPONSORING ORGANIZATION — 8b. OFFICE SYMBOL (If applicable)	9. PROCUREMENT INSTRUMENT IDENTIFICATION NUMBER
8c. ADDRESS (City, State and ZIP Code)	10. SOURCE OF FUNDING NOS.
11. TITLE (Include Security Classification) See Box 19	

10. PROGRAM ELEMENT NO.	PROJECT NO.	TASK NO.	WORK UNIT NO.

12. PERSONAL AUTHOR(S)
Susan K. Mashiko, B.S.A.E., Capt, USAF   Gary C. Tarczynski, B.S.E.E., Capt, USAF

13a. TYPE OF REPORT	13b. TIME COVERED	14. DATE OF REPORT (Yr., Mo., Day)	15. PAGE COUNT
MS Thesis	FROM ______ TO ______	1985 December	647

16. SUPPLEMENTARY NOTATION

17. COSATI CODES		
FIELD	GROUP	SUB. GR.
[illegible]	02	

18. SUBJECT TERMS (Continue on reverse if necessary and identify by block number)
MICROCOMPUTERS, COMPUTER AIDED DESIGN, COMPUTER PROGRAMS, CONTROL SYSTEMS, CONTROL SYSTEM DESIGN AND ANALYSIS, CONTROL THEORY

19. ABSTRACT (Continue on reverse if necessary and identify by block number)

Title: Development of a Computer Aided Design Package for Control System Design and Analysis for a Personal Computer (ICECAP-PC)

Thesis Chairman: Dr. Gary B. Lamont

Approved for public release: IAW AFR 190-1~~7~~.
[illegible] 16 JAN 86
LYNN E. WOLAVER
Dean for Research and Professional Development
Air Force Institute of Technology ~~(ATC)~~
Wright-Patterson AFB OH 45433

20. DISTRIBUTION/AVAILABILITY OF ABSTRACT UNCLASSIFIED/UNLIMITED [✓ X] SAME AS RPT. ☐ DTIC USERS ☐	21. ABSTRACT SECURITY CLASSIFICATION UNCLASSIFIED

22a. NAME OF RESPONSIBLE INDIVIDUAL	22b. TELEPHONE NUMBER (Include Area Code)	22c. OFFICE SYMBOL
Dr. Gary B. Lamont	513-255-3576	AFIT/ENG

DD FORM 1473, 83 APR   EDITION OF 1 JAN 73 IS OBSOLETE

UNCLASSIFIED
SECURITY CLASSIFICATION OF THIS PAGE

UNCLASSIFED

SECURITY CLASSIFICATION OF THIS PAGE

This investigation developed a computer-aided design (CAD) package for control system design and analysis. The package was implemented on different varieties of small personal computers.

Structured design and other software engineering techniques were applied during the development effort. The program consists of a keyword-driven menu structure and a set of control system analysis procedures. The analysis procedures allow input of systems which are defined by transfer functions, polynomials, and matrices. Polynomials and matrices can be manipulated mathematically, and some block diagram manipulation can performed on transfer functions as well.

The program is only part of a continuing development effort in the Information Sciences Laboratory at the Air Force Institute of Technology.

UNCLASSIFED

SECURITY CLASSIFICATION OF THIS PAGE